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THE EPILEPSIES: WITH A NOTE ON RADICAL THERAPY*

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MONTREAL

FORTY-SIX years ago the Shattuck Lecture was delivered to this society by my former teacher, Sir William Osler. Some time later he wrote a note which has been placed by Dr. Francis in the *Bibliotheca Osleriana*. The note was as follows: "At the Shattuck Lecture — while the President was anointing the orator — looking over the 1200 men in the big Mechanics Hall I received a definite impression that never before had I seen so large a collection of doctors with faces indicating breeding and pasture." High praise these words, written with no possible taint of intended flattery. Osler has trod his measure, as have your predecessors of two generations past. But no doubt he would say the same today if he were here, as I wish he were, for New England's pastures are still green with finest fodder. I refer to the pastures of mind and soul as well as of body.

The acceptance of the honor of giving the Shattuck Lecture carries with it, it seems, certain embarrassing responsibilities: first to submit a manuscript worthy of publication in the *New England Journal of Medicine*, and second to make the presentation in a form which may be palatable to practitioners of every hue of medical interest (if such a thing is possible). These considerations have led me to rewrite the address since the title was submitted. In the process of doing so the treatment of epilepsy due to lesions of birth and infancy has now been made secondary to a preliminary consideration of the classification and study of all the epilepsies.

DEFINITION

From a physiological point of view, epilepsy may be defined as a tendency to periodic involuntary neuronal explosions. For the patient, on the other hand, it is a state of continuing dread (usually shared by his friends and family), interrupted by recurring attacks of involuntary behavior. Hughlings Jackson pointed out that there is during each attack a "local discharge of gray matter." Whatever the type of case may be, it is best for practical purposes to consider that all seizures begin locally in the central nervous system.

The primary problem is to determine the location of the initial neuronal explosion which is indicated by the pattern of the fit. The secondary task is to discover, if possible, the nature of the irritating cause. The physician must therefore have two standards of classification, first according to the clinical type of fit, and second according to cause. He must answer two questions: Where is the focus? What is the cause?

CLINICAL CLASSIFICATION

A sane and useful classification of epilepsy is that described by Cobb[1] (Table 1). He has listed a number of clinical varieties, subdivisions which are obvious and simple and hoary with age. These patterns and types of attack depend on the location of the discharge within the brain. I should like therefore to modify such an outline, adding to it so far as possible the anatomical imputa-

TABLE 1. *Types of Clinical Seizures (Cobb[1]).*

Dizziness (or aura)
Lapse (petit mal)
Lapse with oculomotor spasms
Lapse with neck spasms
Lapse with falling
Lapse with wetting
Inhibition (cataplexy)
Vasovagal and autonomic fits
Sensory fit (or aura)
Sensory fit with smacking and swallowing
Déja vue and dream states
Confusion
Rages, fugues and ecstasies
Automatic, stereotyped locomotor attacks
Epilepsia procursia
Co-ordinated epilepsy (Rosett)
Convulsion (clonic jerks) (grand mal)
Convulsion (postural spasms)
Myoclonus (regional)
Epilepsia partialis continua
Jacksonian fit

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tions associated with each group as in Table 2. The different clinical patterns of seizure from which this classification is made usually remain surprisingly constant for any given case.

The use of electroencephalography has caused Gibbs, Gibbs and Lennox[2] to approach the classification of epileptics from an entirely different point of view. As you know, when electrodes are placed on a patient's scalp electrograms analogous to electrocardiograms may be made of the "brain waves." During a seizure the normal cerebral

TABLE 2. *Epilepsy: Clinical and anatomical classification.*

CLINICAL TYPE	LOCALIZATION
Lapse (simple loss of consciousness, petit mal)	
Psychomotor (rages, fugues, confusions)	
Automatic behavior and confusion (postseizure release)	
Generalized motor	Motor and associated systems
Focal motor (Jacksonian)	Pre-Rolandic
Sensory (somatic)	Post-Rolandic
Visual (lights, darkness)	Occipital
Auditory (buzzing)	Temporal
Rotatory (dizziness)	Temporal
Gustatory (smacking, swallowing, salivation)	Lower Rolandic
Olfactory (uncinate fit)	Infratemporal
Perceptual (*déja vue*, unreal, near, remote)	Temporal
Dream states (elaborate)	Temporoparietal
Autonomic (vasovagal, and so forth)	Diencephalic
Opisthotonic ("cerebellar")	Mesencephalic
Myoclonic (muscle jerks)	Bulbospinal

rhythm is interrupted by an electrical disturbance which originates in that part of the brain where the epileptic discharge begins. These authors would rename epilepsy "paroxysmal cerebral dysrhythmia." And they further suggest three subdivisions, grand mal, petit mal and psychomotor, according to the form of electrical wave and its frequency.

For a practical classification, grand mal may be discarded. Whether the other two types of tracing indicate essentially different kinds of fits, or whether the difference in the curves is derived from the peculiarity of that part of the brain in which each arises, must be settled at a later time. For true petit mal and psychomotor attacks no localization is proposed in this classification.

Seizure Pattern

Lapse. From a clinical point of view the essential feature of petit mal is primary loss of consciousness without immediately succeeding convulsion. In my opinion this loss of consciousness must result from a discharge in the highest level of neural integration, which is situated not in the frontoparietal cortex but probably in a zone nearer the base of the brain and brain stem. It seems to me quite possible that the petit mal dysrhythmia is only the wave form which results from epileptic discharge in that area of the brain, and is not otherwise an indication of a different form of epilepsy. Petit mal attacks, like the other types, may change gradually into those of grand mal. Brief attacks of another sort, especially if they arise in the temporal lobe, may easily be mistaken for true petit mal.

Psychomotor. Psychomotor seizures are disturbances of consciousness (or mental disturbances) which accompany epileptic discharges in neurone circuits not yet identified, but which may also be related to the highest level of neural integration. The attacks may be quite short or may be subclinical.

Automatic behavior and confusion. Post-seizure automatic behavior and confusion probably result from the actual paralysis that follows a seizure. It must be located in this same high level of neural integration. Thus the lower centers are intact and the patient can walk about and carry out complicated acts, such as mixing up the ingredients for cocoa in the garbage can or striking a friend, but conscious direction is absent. The seizure may have been severe or mild. When no seizure is observed it may be an open question whether or not a psychomotor seizure is in progress, producing a so-called psychic variant.

It is true that petit mal, as well as psychomotor seizures, is rarely produced by objective focal lesions. They have never been reproduced by electrical stimulation, and they are in general not susceptible to surgical therapy.

We may now turn to the other and less mysterious types of epileptic seizure the anatomical substratum of which we know or can surmise. It must be admitted that some of the localizations are tentative. The pattern of each attack must be carefully determined by questioning the patient and family, and often by the direct observation of specially trained nurses in the hospital. Seizures may often be produced by withdrawal of medication for a few days. Hyperpnea lasting for ten minutes produces temporary alkalosis and often precipitates a typical attack. If necessary the patient may be put on a hydration regime, first described by McQuarrie and Peeler[3] in 1931 and modified by Keith.[4] Fluids are forced, and 0.5 cc. of pitressin is given hypodermatically every two hours for one or two days until an attack occurs or until signs develop that make discontinuance advisable, for example abdominal cramps, headache and vomiting.

In general, attacks that begin with the turning of the head or eyes to the right have been initiated in the left hemisphere, and vice versa. Only very occasionally is this rule reversed. If an aura is the first evidence of an attack the focus is usually behind the central fissure of Rolando. If an attack begins with initial loss of consciousness it is usually initiated anterior to the Rolandic gyri.

Generalized motor. The first type of seizure is the generalized one all too familiar to every physician, characterized by generalized tonic-clonic contraction of the muscles of all extremities and trunk, and sometimes by frothing at the mouth and tongue-biting. In such attacks a discharge of nerve cells is taking place in the pyramidal and extrapyramidal motor systems of cortex and basal ganglia in both hemispheres, and evidently also in the diencephalon, if not lower in the brain stem, for there is frequently loss of sphincter control and marked disturbance of respiration, as well as invariable loss of consciousness. This generalized fit may develop as the sequel of one of the other types of seizure, for the motor and associated systems seem to be the final common path for discharges of great intensity anywhere in the brain. But each of the other types may occur by itself without spread, and it seems likely that a so-called generalized seizure may occur without involving all parts of the brain such as the frontal, occipital and temporal regions.

Jacksonian. This type of seizure has been well known since Hughlings Jackson described the typical march of movement, for example from face to fingers, hand, arm and leg. Somatic movement is represented as though on a map in the precentral gyrus (Penfield and Boldrey[5]). In general the body is upside down, with the area controlling the foot at the longitudinal fissure and that of the hand below that of the arm with the thumb area lowermost. The head area is below, but it is right side up. Between brow and mouth areas comes that of vocalization, a high-pitched continuing cry (not words). Below the mouth area and near the fissure of Sylvius is that of the tongue and then those of swallowing, salivation, chewing.

Sensory. A postcentral focus may produce a sensation of tingling, numbness, movement or desire to move in a similar contralateral part. This may spread across the central fissure to produce clonic movement of the same part, or there may be simple postcentral spread resulting in a sensory march through the sensory body representation. In general the sensory map corresponds with the motor map which lies anterior to it.

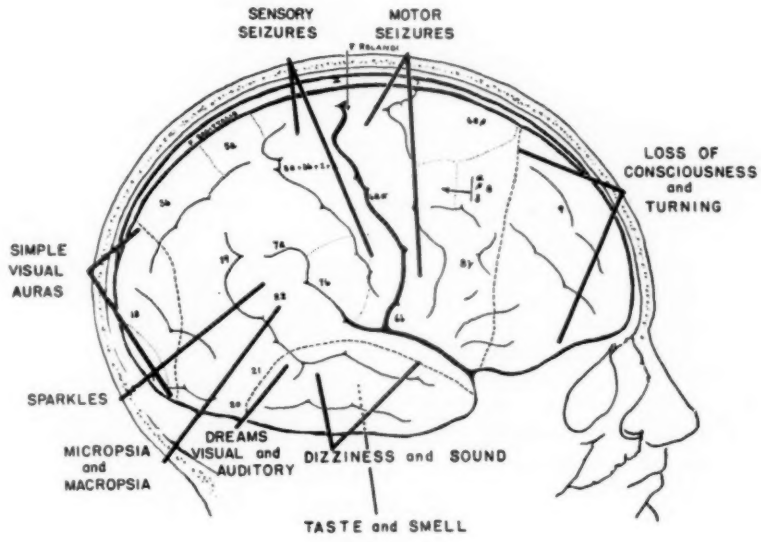


FIGURE 1.

Chart of common initial phenomena in epileptic seizures arising in different areas of the brain (Penfield and McEachern[34]). Reproduced by courtesy of the Oxford University Press.

Visual. A simple visual hallucination, seen either in front or at the opposite side, points to the occipital pole. Sparkling lights like electric-light advertisements arise a little more anteriorly at the junction of occipital and parietal lobes.

Auditory. Sound as an aura is usually buzzing or rumbling. The discharge is localized in the temporal lobe and is apt to be referred to the opposite side of the head or opposite ear. There may be no reference, however, to either side.

Rotatory. A sense of rotation or true unsteadiness also results from discharge in the temporal lobe, and is apt to be associated with an auditory aura as well.

Gustatory. Attacks which begin with smacking, swallowing and salivation may not be remem-

bered by the patient as associated with any sense of taste. It is a pantomime of tasting, but the actual sensation is forgotten or never existed. The discharge is occurring in the lower Rolandic gyrus just above the fissure of Sylvius.

Olfactory. A sense of smell which is practically always disagreeable indicates discharge in the vicinity of the uncus and the seizure is therefore called an uncinate fit. At any rate the focus is to be expected in a zone beneath the temporal lobe of either side.

Perceptual. Alteration in the interpretation of things seen or heard is a fairly frequent aura. Things may suddenly look large (macropsia) and seem near, or they may look small (micropsia) and seem far away. The latter may give the feeling of remoteness. The patient may perceive things, but they may suddenly seem unreal. Things heard may seem inexplicably loud. Another frequent aura is a sudden feeling of familiarity with the present surroundings, the patient thinking he has been there before (*déja vue*). All these alterations in perception, whether visual or auditory, have seemed to me to be produced by discharge in the temporal lobe.

Dream states. Elaborate dreams and visions, usually recurring in identical form, also memories of complicated scenes or situations, result from discharge in the posterior temporal lobe, including adjacent parts of the parietal and perhaps occipital lobes.

Autonomic. A whole train of autonomic phenomena, such as alterations in heart rate and blood pressure, sweating, piloerection, pupillary change, and so forth, may occur as the result of discharge in the diencephalon without somatic alteration. Or these phenomena may precede a generalized seizure. They originate in the diencephalon adjacent to the third ventricle. After having stimulated electrically the cerebral cortex of hundreds of conscious patients I have found little evidence of autonomic representation in the cerebral cortex, as would be expected from the experimental conclusions of Fulton.[6] It seems possible that autonomic phenomena may result from discharge in the midbrain and the medulla oblongata, but of this I am not certain.

Opisthotonic. The so-called cerebellar fits of Hughlings Jackson do not result from discharge in the cerebellar hemispheres but from discharge in the adjacent nuclei of the midbrain. A frequent cause of such attacks is posterior fossa tumor, which is apt to be found infiltrating the brain stem. Severe head injury which produces a decerebrate state may also produce recurring attacks of rigidity, which probably belong in the same category. Tonic fit also describes these attacks of truncal spasm.

Myoclonic. Jerks of individual muscles or isolated muscle groups result from discharge in the medulla oblongata and the spinal cord.

LOCALIZING PROCEDURES

Other methods of localization must be employed: neurological examination, pneumography, electrography or electrical stimulation of the exposed brain.

Details of neurological examination need not be stressed here. Smallness of one extremity or one side of the face or trunk, if it means a cortical lesion at all, indicates a definite lesion of the corresponding area of the opposite postcentral gyrus which has occurred within the first year or two of life.

Pneumographic encephalography is an important procedure. An expanding lesion displaces the ventricles from the focus and tends to cause dilatation of the opposite ventricle. Non-neoplastic lesions usually cause enlargement of the nearest portion of the ventricle out toward the lesion. Large meningocerebral cicatrices may result in migration toward the site of injury not only of the adjacent lateral ventricle but also of the septum pellucidum and the third ventricle.

Electroencephalography is of great value in localization of epileptic foci. If an attack occurs during examination the dysrhythmia begins first at the site of the focus and spreads to other parts. If no attack occurs, random delta (slow) waves may be found over an area of cerebral injury. In the vicinity of isolated epileptogenic foci there may occur spike-shaped waves.

ETIOLOGIC CLASSIFICATION

It is further necessary to classify cases according to cause. At present they must be divided into two main groups: functional, that is without an objective cerebral lesion, and organic, that is with an objective cerebral lesion (Table 3).

TABLE 3. *The Epilepsies: Etiologic classification.*

TYPE	CAUSE
FUNCTIONAL GROUP	
Idiopathic (genuine)	Abnormal cerebral physiology
Toxic and febrile	Extracerebral origin
Hypoglycemic	Extracerebral origin
Miscellaneous (angioneurotic, circulatory arrest, and so forth)	
ORGANIC GROUP	
Neoplastic*	Extracerebral or intracerebral tumors
Cicatricial*	Sequel of trauma, abscess, and so forth
Focal microgyria*	Ischemia and compression at birth
Atrophic focal*	Compression, infection, vessel closure
Brain cyst*	Occlusion of large vessel
Hemorrhagic cyst*	Non-fatal cerebral hemorrhage
Degenerative	Progressive brain disease
Congenital	Developmental cerebral abnormality
Diffuse vascular	Arteriosclerotic, syphilitic, and so forth
Miscellaneous	Various cerebral abnormalities

*Susceptible to surgical attack.

In functional cases no objective abnormality of the central nervous system can be demonstrated by present-day methods. The cause may be considered physiologic rather than pathologic. In these cases the condition almost always makes its first appearance in the early teens. If the attacks begin in childhood some cerebral cause can usually be demonstrated; the term "idiopathic" must be used until further advance in circulatory or metabolic physiology defines their cause. The fact that the pattern of attack in most idiopathic cases remains constant for years suggests that the cause must be in the brain itself, at least in part, and not in some pathologic metabolic alteration at a distance.

The examples of seizures of toxic and febrile origin must sometimes be due to the effect on a normal brain of a convulsant element in the blood stream, as in certain toxemias. But sometimes this is not the case. A brain which has a lesion may give rise to no seizures until the patient has a general illness, whereupon seizures appear. Moreover, in the febrile illnesses of children convulsions may be a sign of cerebral thrombosis secondary to extreme dehydration and blood thickening. Years later chronic epilepsy may appear as the result of such a vascular insult.

Hypoglycemia, like the toxemia of pregnancy, is an excellent example of extracerebral cause. Obviously treatment is then to be directed toward the cause, and in cases in which attacks appear after a fast, studies should be made of the blood sugar.

In the organic group there are as many different subdivisions as there are lesions and varieties of conditions that may affect the brain. The epilepsies, which they must be called, are alike only in the outward manifestation of recurring seizures. These seizures are an evidence of abnormality of the brain, just as recurrent spasms of coughing are an evidence of one among many possible diseases of the lung. It is the cause of the fit, like the cause of the cough, that forms the primary clinical problem.

There is one other useful means of classification of the epilepsies (Table 4). The age at onset provides a tentative initial classification. Seizures in infancy suggest early brain injury. Onset of seizures about the age of puberty without antecedent history of head injury suggests idiopathic epilepsy. Attacks which begin after the age of twenty suggest the possibility of a brain tumor, brain scar or cerebral vascular lesion. The case of the adult who develops recurring seizures with no history of severe head injury should be diagnosed as brain tumor until proved otherwise. These distinctions are not hard and fast. For example, epilepsy due to birth injury may also occasionally begin at puberty, and tumors of the hemispheres may occur in children.

TABLE 4. *The Epilepsies: Presumptive classification according to age at onset.*

AGE AT ONSET	PRESUMPTIVE CAUSE
yr.	
0–2	Birth injury, degeneration congenital
2–10	Birth injury, febrile thrombosis, trauma
10–20	Idiopathic, trauma
20–30	Trauma, neoplasm
30–50	Neoplasm, trauma
50–70	Vascular, neoplasm

RADICAL THERAPY

Classifications of disease are useful if they serve as a guide to intelligent therapy. It is not my intention to attempt to describe conservative therapy or to minimize its importance. Any patient suffering from epilepsy must be given a careful general medical examination. Hypoglycemia and toxic states must be ruled out, and in general any remediable abnormality must be corrected. All such patients must be warned against constipation, alcohol and fatigue. Phenobarbital, bromides, Mebarol or Dilantin must be used symptomatically, and a ketogenic diet may be tried in children. Dehydration in my experience is of very little use. Direct surgical attack is possible in certain of the organic epilepsies, as indicated in Table 3.

Cerebral neoplasm. It is unnecessary to discuss the surgery of brain tumors in Massachusetts, where I for one received my neoplastic baptism, however brief, in the clinic of Dr. Harvey Cushing. But it is not always recognized how frequently seizures are associated with tumor, and furthermore how frequently seizures continue after the removal of the tumor. With Dr. Theodore C. Erickson and Dr. Isadore M. Tarlov[7] I have recently reviewed 703 cases of verified intracranial expanding lesions. The incidence of seizures for all supratentorial lesions was 44 per cent. The incidence of fits with astrocytoma, however, was 70 per cent, and of those with meningeal fibroblastoma 67 per cent. I shall not go into the details at present, as this analysis will be reported elsewhere, but it is obvious that the treatment of epilepsy by the removal of cerebral tumors is less encouraging than its treatment by the radical extirpation of atrophic focal lesions.

Focal lesions of the adult. Focal non-neoplastic lesions of adult life have been discussed by me before, and a complete follow-up on such cases was reported[8] in 1936. The study and treatment of these cases may be illustrated, however, by description of a recent case the somewhat trying details of which still linger in my memory.

Case 1. A school teacher of 32 was in an automobile accident and was completely unconscious for 3 days. For another 14 days he was aphasic and almost maniacal. After that his condition seemed to clear up quite quickly and he resumed teaching. About 14 months after the accident, however, he had a major convulsion, and during the succeeding year he had two other seizures. He was seen at the time of the accident by Dr. Francis Grant, of Philadelphia, who found a fracture low down in the left parietal bone. After his attacks developed he was seen by Dr. Stanley Cobb, of Boston, who found some electrographic evidence of a discharging focus in the left parietal region.

On the suggestion of both Dr. Grant and Dr. Cobb we carried out a pneumogram which showed some enlargement of the left lateral ventricle and marked enlargement of the left inferior horn. Physical examination was negative, mental activity quite normal. No one had seen the attacks, however, and we knew nothing of their pattern. It was therefore decided to postpone decision for a year.

At the end of a year we reviewed the case. Pneumoencephalography was repeated; the films showed no change. The electrogram seemed to point to abnormal activity on the uninjured right side of the head, although the electrographic interpretation suggested that this might be due to an artefact produced by movements of the large temporal muscle. Consequently I made a small trephine hole in each temporal region and placed an electrode just beneath the bone edge of each hole. Thus the electrode lay between bone and dura, while the insulated wire was brought out through a needle tract in the scalp and allowed to emerge from the dressing in such a way that

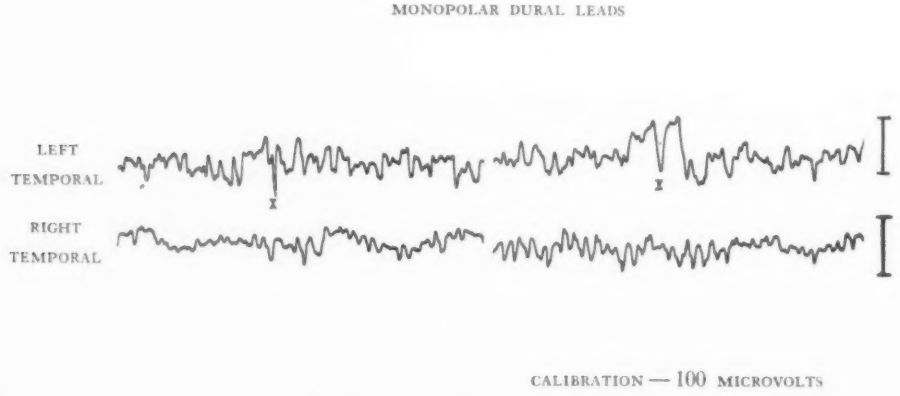


FIGURE 2. *Electroencephalogram, Case 1.*
Records made from extradural leads beneath temporal muscle of each side. "X" marks a characteristic spike.

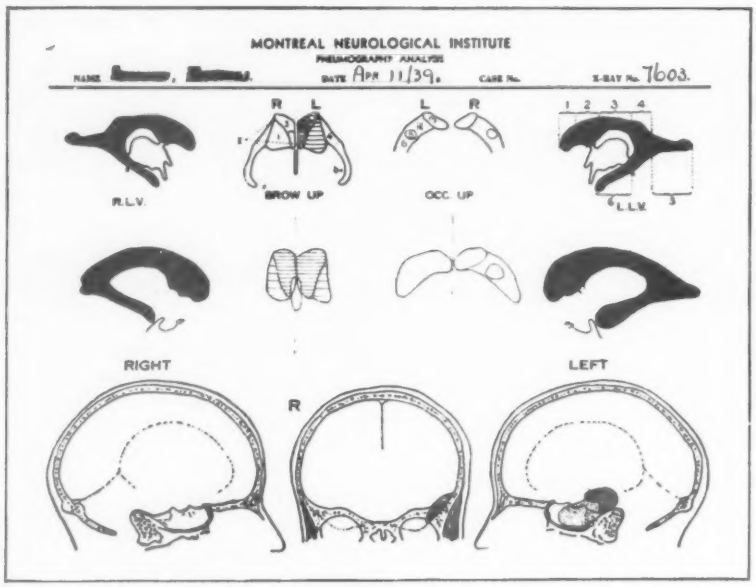


FIGURE 3. *Pneumographic Analysis, Case 2.*
This shows enlargement of the left inferior horn of the ventricle beneath the meningocerebral cicatrix.

electrograms could be taken on several successive days. These showed that the misleading localization was due to artefact. Both delta activity and epileptogenic spikes were found to be coming from the left temporal region deep beneath the temporal muscle. These spikes may be seen at *X* in Figure 2, while the right temporal tracing serves as control.

Craniotomy was therefore carried out, and a dense scar was found in the left temporal lobe beneath the fracture patient talk continuously with a psychologist* who sat with him. No defect in speech developed during the removal and he seemed quite well on returning to his room. That evening, however, he seemed to lose emotional control and swore a good deal. The next day he was completely aphasic and difficult to restrain. Not until the 7th day did speech begin to return. At the present time, 2 months after operation, his speech and mental processes are apparently normal.

FIGURE 4. *Pneumogram, Case 2.*

This was taken with the brow up and shows the falx nearer the left cranial vault than the right, and the third ventricle still nearer.

line (see shading in left lateral view, Figure 3). The posterior portions of the first and second temporal convolutions were involved in a gelatinoid scar, and there was some involvement of the third convolution as well. Electrical stimulation was carried out, but it was found impossible to reproduce a seizure by stimulation of the borders of the lesion with any strength of current that I cared to use.

The patient was right-handed. The exact localization of speech function is not altogether clear, but we had in another case removed a severe scar in this region without producing aphasia. It seemed evident that most of the scarred tissue could not be serviceable for normal function. Consequently we made a radical removal in all three convolutions, insisting that during the removal the

Epileptogenic focal lesions of birth and infancy. These lesions are represented by a group of cases heretofore largely unrecognized and, I am beginning to suspect, quite numerous. Evidence of such lesions may be lacking until the onset of seizures in the first or second decade of life.

It has long been recognized (Little,[9] 1862; Freud,[10] 1897) that paralysis may be the result of birth injury, and numerous autopsy studies of newborn babies have demonstrated the frequency of

*Dr. Donald Webb kindly talked to him during the operation and made a study of his psychological changes during convalescence.

cerebral compression due to intracranial bleeding. There has also been evidence of asphyxia in other organs, and actual softening of areas of the brain due to compression and hemorrhage. However, those babies who receive mild cerebral injuries and who do not show paralysis or mental deficiency constitute a little-recognized group. Such cases are not brought to the attention of a physician until the onset of epileptic seizures. A detailed study of such cases will soon be reported by Penfield and Keith.[11] The following case serves as an example.

Case 2. A French-Canadian girl of 13 was referred to us by Dr. James H. Remington of Three Rivers, Quebec, complaining of epileptic seizures, which had begun 1 year previously. There had been numerous mild attacks (five to ten times daily) consisting of numbness and tingling, *engourdissement,* in the fingers of the right hand. At intervals of about a month there had been major seizures, several sometimes occurring in a day. These attacks were ushered in by tingling of the fingers of the right hand, as in the minor seizures, but the sensation mounted to the shoulder, the eyes turned to the right, the right arm made clonic movements and the face was drawn to the right. The patient lost consciousness, frothed at the mouth and was incontinent of urine. The attacks were not associated with aphasia, although the right arm was apt to be weak after a seizure. The patient was ambidextrous.

Her birth was more difficult, as reported by Dr. Remington, than that of the other children in the family. During pregnancy her mother had suffered from severe headache and vomiting. At the termination of 8 hours of labor the child was "blue and suffocated." Feeding was difficult. The later development, both mental and physical, was normal. The usual diseases of childhood occurred.

Physical examination was essentially negative. Cerebrospinal fluid and blood examinations were normal. There was no bodily asymmetry, but roentgenograms showed the left cranial chamber to be smaller than the right, the septum pellucidum being nearer the left vault than the right (Fig. 4). The posterior part of the left lateral ventricle was somewhat enlarged, chiefly laterally. An electrogram report was as follows: "Epileptiform spikes were obtained from a well-localized area beneath the left parietal head region. . . . These epileptiform waves were increased in amplitude and number with hyperventilation but retained their localization." In Figure 5 the spikes are seen reversing at *X;* the lower spot on the patient's scalp in the inset indicates the localization.

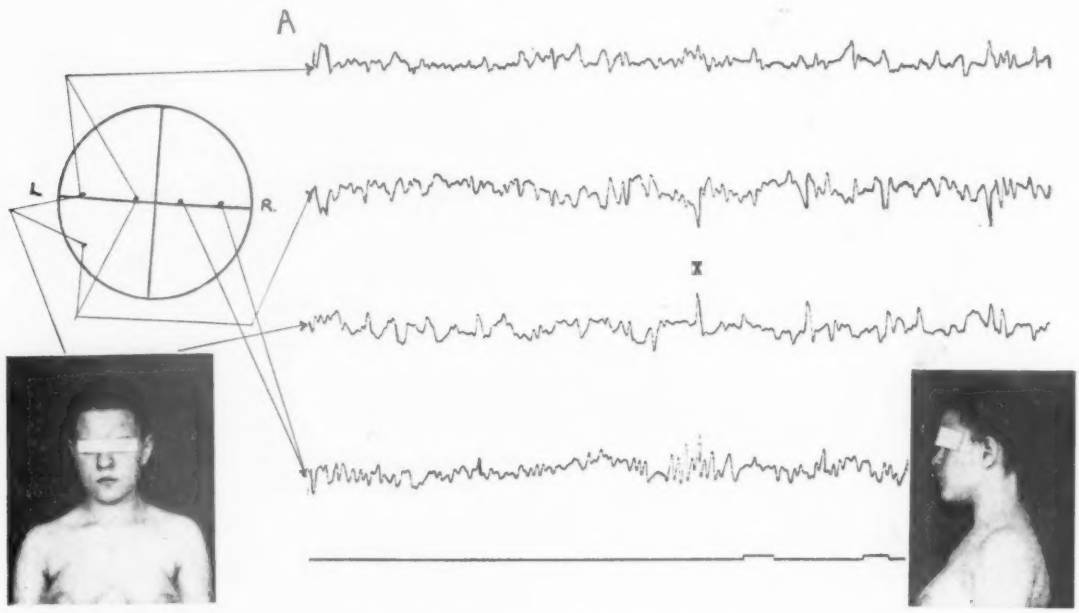


FIGURE 5. *Electroencephalogram, Case 2.*

The spike waves, reversing at "X," indicate a focus between the two leads on the left side of the head. The localization was at the spot seen above and behind the ear, as shown in the inset.

Operation was carried out under local analgesia, a left posterior flap being turned down. A patch of small gyri covered with whitish thickening of the pia was found at the expected area (Fig. 6*a*). This patch included three small gyri, as narrow as 2 or 3 mm. in some portions but extending to a depth of 2 cm. They were pressed together so that removal left no more space than should be occupied by one gyrus of normal width (Fig. 6*b*). The postcentral gyrus lay directly anterior. By careful sharp dissection the pial covering was left intact over it and the other surrounding gyri. Electrical stimulation of the postcentral gyrus at point C produced a sensation in the patient's right hand which she said was a good deal like the aura of her habitual seizures. The rest of the brain appeared normal. There had been adhesions between dura and pia, over the lesion only, but these did not contain blood vessels.

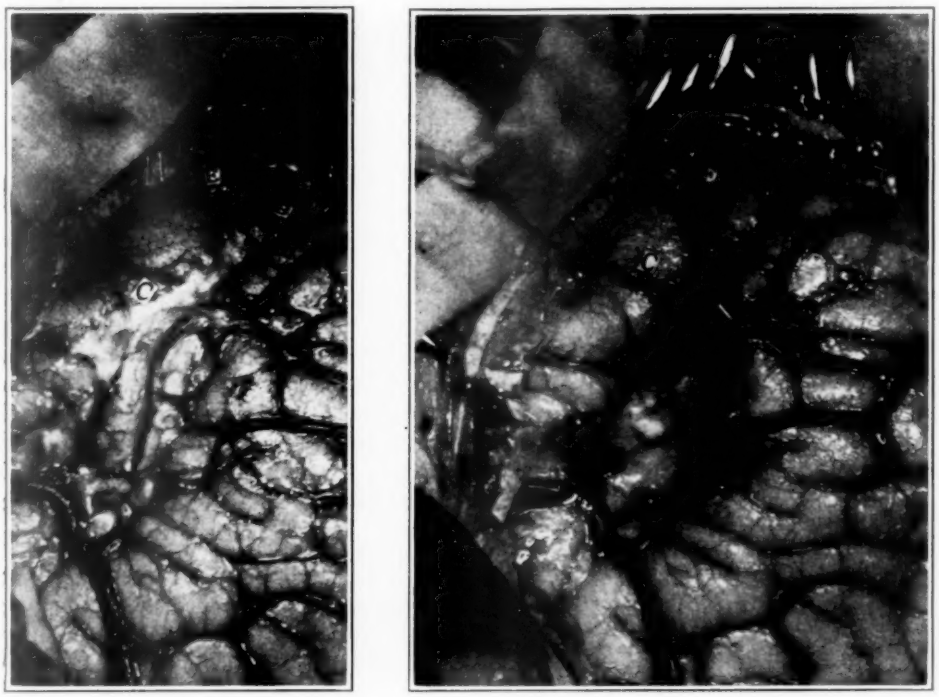
Recovery was uneventful. The patient was discharged without medication and has been free from attacks up to the present time (6 months). On discharge an electro-

gram showed no more epileptiform spikes but some delta waves anteriorly and posteriorly to the zone of removal.

In summary, the evidence indicates that this child received an injury at birth which produced an area of focal microgyria. During subsequent growth the cranium remained a little smaller on that side than on the right. The seizures appeared first at the age of 12, arising in the adjacent postcentral gyrus. The lesion was removed, the postcentral gyrus being left intact.

the enlarging hemispheres. The normal convolutions therefore crowd on the damaged convolutions, pressing them together so that three or four such convolutions may occupy the space of one normal one and that half the cranial vault may be smaller than the other.

In this process of readjustment the shape of the



A B

FIGURE 6. *Operative Photographs, Case 2.*

The three small gyri beneath the whitened arachnoid in "A" *composed the focus of microgyria.* "B" *shows the brain after removal of the area.*

FOCAL EPILEPTOGENIC LESIONS

Focal microgyria. This is a condition that has been recognized only recently. The results of therapy are in general quite encouraging. The mechanism of production is of interest. Apparently during childbirth actual pressure on one convolution or group of convolutions may be greater than elsewhere, so that if the blood supply through the umbilical cord is compromised ischemia may be produced in that convolution or convolutions which is greater than the ganglion cells can tolerate. The latter are irretrievably damaged by a few minutes of complete ischemia, while the interstitial neuroglial cells and pia mater may easily survive. This results in a small, shriveled gyrus with few or no adhesions and without evidence of early hemorrhage.

The rapid growth of the cranium during the first year of life is due to the outward thrust of ventricle is preserved while the normal convolutions move forward or back, as shown by their unexpected position within the skull, or even from the midline outward, as shown by the lateral placement of the pacchionian granulations in one case and the lateral origin of the cerebral veins tributary to the longitudinal sinus in another. The direction of the movement is toward the damaged gyri, wherever they may be. Consequently such early lesions are apt to produce little deformity of the ventricle but distinct smallness of one cranial chamber. Histological examination of these small gyri shows non-ganglionic areas bordered by islands of gray matter and thinned-out gray layers.

Brain cyst. On the other hand, occlusions of large cerebral arteries, which may occur in utero or during the first year of life, destroy that part of the brain completely except for the pia mater and sometimes the ependymal lining of the ven-

tricles. This occurs also without adhesions between pia and dura but results in considerable distortion and local enlargement of the adjacent ventricle. Small gyri are usually present on the border of the cysts.

Meningocerebral cicatrix. This lesion, resulting from traumatic laceration and infantile meningitis, causes dense adhesions between dura and pia, which carry blood vessels. In the center of such scars there is to be found a zone of tissue free of ganglion cells. This scar is very different from that resulting from subdural hemorrhage, which leaves behind only yellowing of the pia and threadlike avascular adhesions.

Histology of epileptogenic foci. For years I have studied brain scars, and during the past year with the able assistance of Dr. Storer Humphreys have examined microscopically epileptogenic focal lesions removed in a series of 95 cases of focal epilepsy, none of which were neoplastic. There is in general an area where nerve cells are absent, a non-ganglionic glial scar which may have much or no admixture of connective tissue. Between the scar and the normal gray matter there is an intermediary zone of partially destroyed gray matter. In all these specimens, however, even twenty or thirty years after the lesion was produced, there is evidence of advancing destruction, occurring chiefly in the intermediary zone in very small patches which surround small blood vessels. The evidence, which will be presented in detail elsewhere (Penfield and Humphreys[12]), indicates that these minute destructions occur as the result of complete vascular constrictions of the small vessels of the scar. Humphreys[13] has shown that these vessels indeed carry a somewhat greater number of perivascular nerves than do the vessels of the same size outside the zone.

The actual focus in which seizure discharges originate is obviously not the scar or the tumor. It is the frontier zone between the lesion and normal brain. Here electrical stimulation may result in typical seizures and variable vascular spasm seems to occur. It is evidently here that abnormal electrical potentials produce the spikes of the electrogram. It must be here that there occurs the charging process which is preliminary to the discharge of the fit.

Radical surgical therapy should be directed toward removal of the ganglion-free central scar, including the border zone, with reasonable regard to essential brain structure. Excisions must be carried out so as to prevent, so far as possible, revascularization of the margins of the excised area, except from the adjacent cerebral vessels. This must be done in such a way as to leave a pool of cerebrospinal fluid instead of an organizing blood clot.

Focal microgyria, meningocerebral cicatrix and the cystic cerebral cicatrix of arterial occlusion are apt to produce seizures. On the other hand, we have been unable to prove that an old subdural hematoma is in itself a cause of epileptic seizures. It may often be associated with other lesions, and may be in a sense partly responsible for the associated intracerebral lesion which does produce epilepsy.

In considering the problem of initial cause in the case of any epileptic, the importance of minor cerebral lesions at birth and of thrombosis or inflammatory incidents in the febrile diseases of infancy must be borne in mind, even though the onset of the seizures occurs only as long as ten or fifteen years later. In the study of such cases simple anteroposterior roentgenograms of the skull should be examined for proportional decrease in the size of one side of the skull. Such a decrease may be taken as suggestive evidence of an early lesion of the type under consideration.

* * *

In my experience, patients with objective cerebral lesions of the type under discussion never recover spontaneously. There are many such patients who go through life with the diagnosis of functional or idiopathic epilepsy. This fact emphasizes the necessity of attempting to classify all cases, both anatomically and etiologicallv. It is necessary to demand in each instance: Where is the focus? What is the cause?

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THE ROLE OF THE CERVIX IN PREGNANCY AND LABOR*

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MUCH has been written on the subject of contraction rings and constriction rings, yet many obstetricians are still in doubt as to their precise nature. Depending on the particular textbook one happens to read, he may find the condition classified in any one of the following ways: retraction ring; physiologic ring; normal retraction ring; contraction ring; or normal contraction ring. When the ring is supposedly abnormal it is correspondingly classified as pathologic retraction ring, Bandl's ring, pathologic contraction ring or constriction ring.[1] Almost the only point on which there is general agreement is that the ring is at the juncture of what we have been accustomed to call the upper and lower uterine segments. There are those, however, who say that when the ring occurs at this point it is a retraction ring, but others call it a contraction ring and think that it can occur at any point of the uterine musculature. I believe that there is but one ring, call it what we will; that it is always situated at the juncture of the segments; and that if it occasionally seems to be situated elsewhere, this is because of some pathologic process or malposition of the uterus, which makes it difficult for us to believe that the ring is where Nature intended it to be; in other words, that it is a perfectly natural phenomenon.

It seems certain to me that a baby cannot be born through the natural passages as a result of labor without there being a normal physiologic ring. This conclusion I arrived at several years ago as a result of observations made during many operations. Twenty-five or thirty years ago not much had been written about contraction rings, and the consensus was that all rings were pathologic. I concluded that they were purely physiologic, and as years passed I became convinced that labor without a ring was a physical impossibility.

Until 1872 there was no unanimity of opinion as to what changes took place in the cervix during pregnancy and labor. Some authorities held that such changes occurred constantly from the fifth month on — changes which ultimately caused a certain amount of cervical obliteration. Others thought that the cervix, except for a certain amount of hypertrophy and broadening, remained virtually unchanged until a few days or a few weeks previous to the onset of labor, and a few believed that the cervix at term was even longer than the normal non-pregnant one.

In 1872, Braune,[2] as a result of his studies of frozen sections of the uterus of a patient who had died at term during the second stage of labor, reported that there was a circular ring which divided the uterus into upper and lower segments, the musculature being thick and solid above the ring and very thin below it. He concluded that the entire lower segment had been derived from the cervix, and that the ring in fact represented the internal os.

In 1875, Bandl[2] pointed out that if Braune's findings were accurate, certain changes must have been taking place in the cervix for weeks or months previous to labor, and declared it inconceivable that what constituted the cervical canal and internal os could be transformed in a few hours into the type of ring described by Braune. He agreed with the latter that there was a ring situated at the juncture of the upper and lower uterine segments, and that the lower segment was derived wholly from the cervix.

Some of those who dissented from Bandl's and Braune's conclusions maintained that part of the lower segment was derived from the cervix, but that the greater part was derived from the lower portion of the body of the uterus. Others held that the cervix had nothing to do with the formation of the lower segment, but thought that the latter was derived solely from the isthmus of the uterus; they called the upper boundary of the isthmus the anatomic os, the lower boundary the histologic os, and all the tissue between these openings the lower uterine segment. It was finally decided that both Braune and Bandl were wrong, and that the cervix had little or nothing to do with the formation of the lower segment. As a result, these men have passed on with their ingenious ideas thrown into the discard. This paper is an attempt to prove that Braune and Bandl were right, and having done so, to point out that certain of our so-called obstetric principles are based on false premises.

The statement made above that a constriction or contraction ring is a natural phenomenon like the uterine contraction is a strong one requiring some plausible explanation of the need of the

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ring. According to Pascal's law, a force applied to any portion of the surface of an enclosed liquid is transmitted undiminished in all directions, and is exerted unchanged in amount on every equal portion of the surface of the containing vessel, and in a direction at right angles to that surface. My conception of the fetus in utero (with unruptured membranes) is that the fetus and amniotic fluid occupy every available cubic centimeter of space; that is, there is at no time a level surface of water with air between it and the walls of the uterine cavity. On this assumption, the pressure of the amniotic fluid during or between labor pains is the same in every direction, and is therefore directed toward the surface of the baby's body as well as toward every part of the uterine wall. It must be remembered that the contraction of the uterus directs water pressure not only toward the baby but back toward itself. Furthermore, if the height of the fundus and the area of the upper segment decrease, there must be a proportionate increase somewhere in the enclosed cavity, since the amount of fluid remains constant up to the point of rupture. To be sure, since the resistance offered to the amniotic fluid at the site of the os or dilating cervix is less than at any other place, the amniotic sac is forced down through the os or dilating cervix, and helps by pressure, in accordance with Pascal's law, to dilate the latter further. As labor advances and the presenting part descends in the pelvis, it finally becomes so firmly wedged against the walls of the lower segment that it may be impossible for fluid to be directed any longer toward the dilating os, unless there is a new pressure at the lower part of the containing vessel. Such pressure may be caused by the contraction ring's so constricting the entire cavity at a certain point during every contraction as to cause a modified figure-of-eight condition, so that water is forced between the presenting part and the lower segment, not only helping to dilate the os but also increasing the size of the segment.

The theory just presented outlines what we may call an offensive function of the normal contraction ring. On the other hand, it may be that the ring exercises a defensive function, in accordance with the principle of Archimedes, by which bodies immersed in a fluid are buoyed up by a force equal to the weight of the fluid they displace, and since the under side of a body is always deeper in the liquid than the top side, the upward force of the liquid on the under side is always greater than the downward force of the liquid on the top side. That is to say, the ring prevents the upward pressure of water from constantly dislodging the head, by holding the presenting part just firmly enough to prevent its receding.

These contrasting theories are proposed simply as possible explanations of the apparent natural evolution of the contraction ring.

Every obstetrician has met with serious dystocia because of the presence of a contraction ring. Judging from my own experience, the ring never causes trouble before the rupture of the membranes, but only after it. By the laws of physics, until rupture occurs it is impossible for the ring to cause more than a certain degree of pressure; when as a result of the rupture the water pressure no longer controls the contractility of the ring, the latter can and often does become troublesome. We have all had difficulty in delivering an aftercoming head because of a contraction ring's gripping the neck very tightly, and also in doing versions or delivering by forceps. These difficulties may have been due to there no longer being any water pressure directed against the ring by the amniotic fluid.

It may be asked how this theory can explain or can be reconciled with cases in which the membranes are ruptured before labor, or to those in which induction is caused by artificial rupture. Although it is admittedly possible for a baby to be delivered as a result of labor which did not start until after rupture, this does not prove that there is not a natural reason for a normal physiologic contraction ring. In my own cases of such delivery and of those of artificial rupture, the contraction ring, when felt, invariably appeared especially pronounced, probably owing to the fact that there was no water pressure to control its contractile action.

In the medical schools of thirty-five years ago, students were much impressed by the expression "the taking up of the cervix." After they had delivered a few cases they were sure that the cervix had been taken up somewhere, but where or how they were still very much in doubt. Even today well-trained obstetricians are not agreed as to the meaning of the term. That the cervix is taken up, and to a point several centimeters above the former level of the internal os, there is absolutely no doubt, and there seems little question that the contraction ring is only a former part of the cervix. I believe that the taking up starts immediately after the beginning of pregnancy, and that Hegar's sign of softening between the cervix and fundus is only the commencement of this process. The same holds true of the Braxton-Hicks painless contractions of early pregnancy. I am strongly of the opinion that the numerous indefinite contractions, some painless, others painful, which many patients have during pregnancy are due to the constant changes taking place in the cervix, and are part of the phenomenon which we call "taking up." In addition, many so-called

"false labors" are merely painful or painless contractions due to the cervix's being taken up even more before true labor begins.

Irving[3] states, as proof that the contraction ring is not confined to the later months of pregnancy or the beginning of labor at term, that he has seen rings in patients operated on in the earlier months of pregnancy. This is conclusive evidence that a full-term pregnancy is not essential to the presence of a contraction ring. I have seen postpartum signs of such a ring immediately after very early miscarriages; this subject is discussed more fully below.

Many writers of textbooks imply that the contraction ring is somewhat of a "mystical condition" which disappears immediately after delivery. They assert that once an incision has been made and the baby delivered by cesarean section, there is no further evidence of a ring. Several others report that when a hysterectomy has been done in cases of contraction ring no sign of it could be found when the specimen was examined. Still other authors declare that it has been impossible to find evidence of a ring at autopsy. Such statements appear to signify one of three things: if the operation was a supravaginal hysterectomy, it was done above the level of the ring so that the ring did not appear; if the ring was not found at autopsy the patient either lived long enough after delivery for the ring to disappear, or a diagnosis of bad cervical laceration with rupture of the uterus into the broad ligament was made, when the true diagnosis was that of a badly lacerated cervix with a badly lacerated contraction ring.

Many textbooks dismiss the entire question of contraction ring with the birth of the baby, and make no mention of the possibility of a ring's persisting after birth. However, Irving,[4] describing the proper way to pack the uterus in postpartum hemorrhage, mentions that the contraction ring may seriously interfere with this procedure, thus recognizing the presence of such a ring even after delivery of the baby and the placenta.

As mentioned previously, I have performed many operative deliveries. In the early years of my practice, when making an immediate postpartum examination, I was impressed by the fact that the cervix was a far different body than I had been taught to believe it. There were times when it seemed possible that the forceps had caused considerable trauma. I therefore decided to allow all cases to deliver normally, but the findings were identical. The same results occurred when I discontinued the use of pituitary extract, having in mind the possibility of its being the causative agent. I finally realized that whether patients were delivered by forceps — high, mid or low — or by version, or normally, or with or without pituitary, the findings were invariably the same.

At this point it may not be amiss to describe the actual appearance of the cervix. Immediate postpartum examination shows it to be composed of thinned-out, flabby tissue, and circular, the inner rim of the circle being what was formerly the external os. The examining finger on being inserted through the external os and moved upward so as to meet the internal os invariably encounters a hard muscular opening. Between these two openings, however, the finger can be carried anteriorly toward the bladder to about the level of the uterovesicular ligaments, posteriorly to a point comparable to the level of the rectouterine ligaments and laterally to a point as high as and underneath the cardinal ligaments of Kocks. There is thus outlined a circular area, accordion-pleated and almost the diameter of a fetal head. This cavity, which, explored from the external os, extends in every direction away from the examining finger, finally turns on itself and goes downward and inward toward what I have always thought to be the internal os.

In a case I encountered several years ago, this condition, found on immediate postpartum examination, was completely altered twenty-four hours after delivery. There was an external os, a cervical canal, and an internal os very much like the normal cervix at the start of pregnancy or the non-pregnant cervix. It was clear that some change had taken place in the postpartum cervix, but its precise nature I was unable to determine. I now feel certain that what was thought to be the postpartum contraction ring was also the internal os.

Some specimen cervices, taken mostly from my own patients, are shown in the accompanying illustrations. Figure 1 is a microphotograph of a non-pregnant cervix amputated during an operation for prolapse. In this connection, Martzloff[5] describes the normal cervix as follows:

> The wall of the cervix is composed principally of smooth muscle which in greater part is circularly arranged, but there are also fibers here that run longitudinally. Outside of the circular layer there is, according to Stieve, a well-defined longitudinal muscle layer, and Dührssen has described an outer zone composed almost entirely of elastic fibrous stroma. The muscle fibers, which measure from 60 to 80 mm. (Stieve), are held together by a dense fibrous stroma which gives the cervix its firm consistence. We have never been able to demonstrate any of these layers by maceration and dissection methods. In fact, the study of the relations of the muscle layers of the cervix is difficult even when aided by the use of differential staining methods.

The specimen here illustrated shows dense muscle layers. Furthermore, Martzloff, in describing lon-

gitudinal layers, circular layers and elastic fibrous layers seems to give all the necessary components of a taken-up cervix and a contraction ring.

Figure 2 shows an intrapartum cervix at term. The specimen was removed from the cervix when it was dilated two or three fingers. There is relatively much less muscle than in the cervix shown in Figure 1, and there is evidence of severe hemorrhage, showing the trauma suffered during labor.

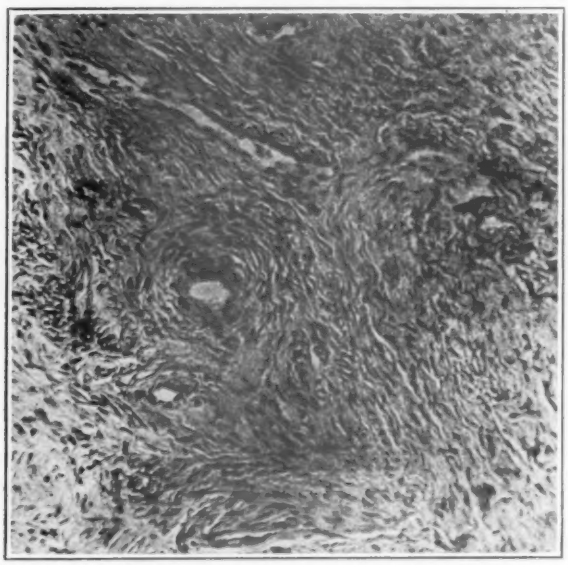

FIGURE 1. *Non-pregnant Cervix: High-power photograph.*

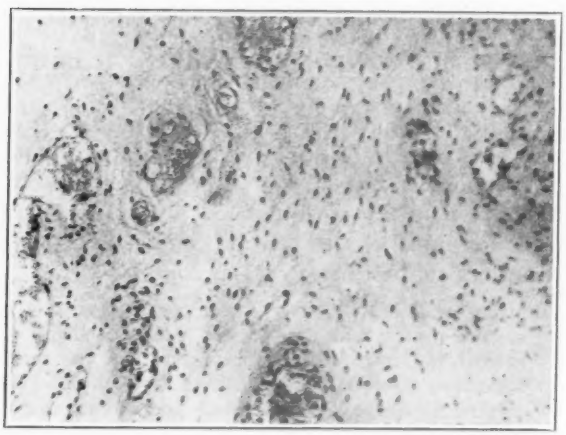

FIGURE 2. *Intrapartum Cervix: High-power photograph.*

Figure 3 illustrates a cervix at term immediately post partum; there is paucity of muscle fiber and, again, evidence of marked hemorrhage. Obviously the intrapartum cervix in Figure 2 and the immediately postpartum cervix in Figure 3 are both markedly different from the non-pregnant cervix. As will be readily understood, it was almost impossible to obtain a specimen from a pregnant cervix at any time from the start of pregnancy to the beginning of labor without doing the patient serious harm.

Figure 4 shows a cervix fifty-two hours after delivery; there is more muscle tissue than in the intrapartum or immediately postpartum cervix, and this cervix more nearly approaches the non-pregnant cervix in Figure 1.

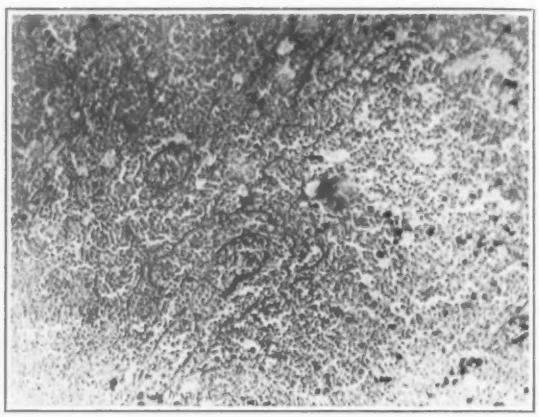

FIGURE 3. *Immediately Postpartum Cervix: High-power photograph.*

My clinical observations, plus the evidence of the microphotographs, indicate that the changes which have taken place in the cervix are due to its having been taken up; that because of this a ring has been formed; and that the ring is derived wholly from the cervix, thereby proving that the lower uterine segment is nothing but what was the cervix at the start of pregnancy. In spite of this testimony, however, stronger evidence is doubtless required.

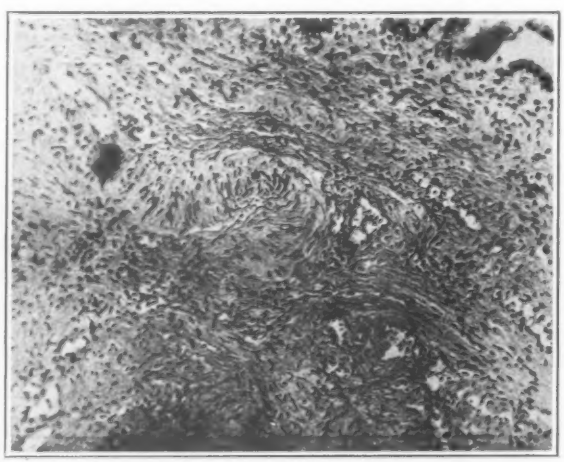

FIGURE 4. *Fifty-two-hour Postpartum Cervix: High-power photograph.*

The postpartum cervix described in detail earlier in this article as discovered in my private cases has been found without exception in a series of cases recently examined at the Boston City Hospital. None of the patients had been given pituitary extract, and all the deliveries were normal. In every case the cervix, the external os, the internal os and the accordion-pleated cavity were the same. A second examination, made from five and a quarter to twenty-four hours post partum, revealed a normal external os, a normal cervical canal and a normal internal os. It was thus even more evident that changes not as yet understood were constantly taking place in the cervix, the result being a normal-appearing cervix within a comparatively short time after delivery. The cervix which was originally taken up had been "taken down." Up to this time these changes have not been described, largely because of the usual warnings given by obstetricians against postpartum examinations, for fear of infection.

As further corroborative evidence, Figure 5*A* outlines the position of the cervix immediately post partum, with the external os and the accordion-pleated cavity between the external os and the internal os or contraction ring, running in every direction; the body of the uterus appears to be directly over the examining finger, extending inward toward the os. A silkworm-gut suture has been passed through the contraction ring and tied loosely in the vagina. Catgut sutures have been placed in the farthest recesses of the cavity. Figure 5*B* shows the condition twelve hours later: a normal postpartum cervix, with the lower strand of the silkworm-gut suture coming out through the cervical canal and the catgut sutures in the sides of the canal, thereby proving that the accordion-pleated cavity, with the sutures inserted as described, has become a normal cervix and a normal canal. This seems conclusive evidence that the contraction ring is only the former internal os in the non-pregnant uterus, and that the lower uterine segment is only what was the normal non-pregnant cervix.

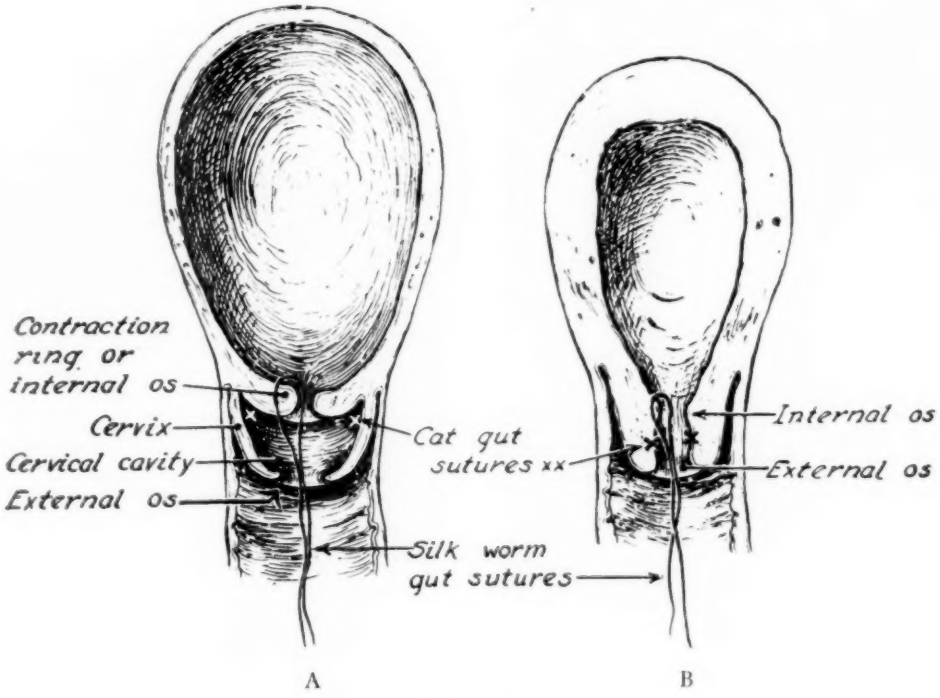

FIGURE 5.

A. Immediately postpartum contraction ring and cervical cavity, with silkworm-gut suture through the former and catgut sutures on sides of the latter.

B. Contraction ring and cervix twelve hours post partum, with silkworm-gut suture coming out through the cervical canal and catgut sutures in the cervical canal.

In a search for corroborative proof, I took x-ray photographs of what I am convinced was the so-called lower uterine segment, immediately post partum. The first (Fig. 6) shows nothing but the uterine cavity. The second (Fig. 7) shows a sterile strip soaked in Lipiodol, the tip of which was placed just within the contraction ring, and the rest of which is spread in the cervical cavity —

the cavity of what was the lower uterine segment. There is constriction at the site of the ring, and the cervical cavity is noticeably large and voluminous.

FIGURE 6.

Both the uterine cavity and cervical cavity were packed with Lipiodol immediately post partum, but the cervical cavity was packed so high that the contraction ring does not show.

The third x-ray film (Fig. 8) — in the same case as that of Figure 7 — demonstrates the contractile portion of the uterus above the contraction ring. The Allis forceps on the cervix shows the size of the cervical cavity between the external os and the internal os.

Figure 9 taken immediately post partum, demonstrates a pack soaked in Skiodan in the cavity of the uterus above the contraction ring, and a Voorhees bag, holding Skiodan, occupying the cervical cavity below the internal os or contraction ring and extending to the external os of the cervix. The Allis forceps attached to the cervix reveals that there is a cavity as described above between the internal os and external os.

Figure 10, taken immediately post partum, shows one Skiodan pack in the cavity of the uterus and another in the cervical cavity; the two cavities are clearly separated by a contraction ring.

Figure 11 shows a uterus twenty-two hours post partum; the cervical cavity has disappeared and has become the normal cervix.

It having now been proved beyond question that Braune and Bandl were right in their beliefs, it remains to show that, with this knowledge in our possession, we should do many things differently than has been our custom.

Some thirty years ago, accouchement forcé was in vogue for delivering many cases of eclampsia, placenta previa, and so forth. The mortality from this operation was extremely high. Many times,

FIGURE 7.

The cervical cavity and contraction ring immediately post partum. A Lipiodol strip has been placed through the contraction ring and also in the cervical cavity.

as a result of forceful dilatation of the cervix, either manually or with instruments, the cervix was torn, the tear was carried up through the broad ligaments to the upper part of the uterus, which was ruptured, and the patient died. However most if not all these patients either were not in labor or were in its early stages, and the cervix had not been taken up. Accouchement forcé was finally and rightfully relegated to the limbo of erroneous procedures, with the result that in recent years, it is safe to say, it has not been performed or recommended by anyone with a proper knowledge of obstetrics. A firm line of demarca-

tion must, however, be drawn between accouchement forcé and dilatation of a cervix which has already been taken up and has started to dilate normally. It is both easy and safe to dilate further many dilating cervices. The accompanying illustrations show how different the intrapartum dilating cervix is from the non-pregnant one. The postpartum cervix gives an idea of how the antepartum cervix must appear before labor has started.

It is a mistake to insist that in certain cases of dystocia no attempt should be made to deliver a patient from below unless the cervix is fully dilated, and that instead a cesarean section should

FIGURE 8.

A Lipiodol strip is in the uterine cavity, with double hooks on the contraction ring. An Allis forceps on the external os shows the depth of the cervical cavity. This plate was taken immediately post partum.

be performed. Our obstetric mortality is far too high, partly because of the large number of cesarean sections that are being done, as a result of many of which the patient dies, when they could have easily and safely been delivered from below. The axiom, "Once a patient has had a cesarean section as a primipara it is excellent judgment to deliver her thus in succeeding pregnancies," may be an excellent one, but many primiparas who are so delivered because the cervix is apparently improperly dilated could be delivered from below without harm to the cervix and without the extreme risk involved in cesarean section. The point to be emphasized here is that with our new knowledge concerning the cervix, one which is not dilating properly can easily be made to do so, thus enabling us in many cases to avoid the necessity of a cesarean section.

In the second place, it is a cause of general surprise that many patients delivered in outpatient departments do not develop infection from faulty

FIGURE 9.

A Skiodan pack is in the uterine cavity and a Skiodan-filled Voorhees bag in the cavity of the cervix, with an Allis forceps on the cervix demonstrating the depth of the cervical cavity. This plate was taken immediately after delivery.

asepsis. It is possible that when the cervix is taken up some secretion is released by it which has so beneficial an action on the vaginal flora as to make infection less likely. If this is so, the vaginal flora is certainly not affected in this way when cesarean section is performed in elective cases before labor has begun. There is little question that the mortality and morbidity from cesarean section might be lowered if every patient were given a short "test of labor" before resorting to cesarean section, in order to permit the cervix to do what Nature intended it to do.

Another source of wonder to obstetricians is the free motility of the uterus immediately post partum as compared with its condition twenty-four hours after delivery. The formation of the lower uterine segment herein demonstrated explains this phenomenon.

Let us now consider a case of placenta previa in the early months of pregnancy, with the placenta centrally located, growing larger from week

to week but with changes constantly occurring in the cervix which prepare what has been called the lower uterine segment — but which I feel sure is the cervix — for labor. The cervical muscle fibers are continually being stretched or pulled, and just as certainly are drawing away from the placental attachment. Does not this explain the suddenness and painlessness of hemorrhage in placenta previa

FIGURE 10.

A Skiodan pack is in the cavity of the uterus and another in the cervical cavity, showing two distinct cavities separated by a contraction ring. This plate was taken immediately post partum.

and its sudden recurrences? Now let us visualize this case of central previa at term, with the outer border of the placenta attached above the contraction ring, and the inner part's being forced down with each contraction so as to become U-shaped. Hydrostatic bags are of doubtful value; indeed, it is impossible to see how they can possibly stop hemorrhage, and they may cause serious harm. My explanation of the so-called lower uterine segment shows that delivery, either by Braxton-Hicks version or by cesarean section, is a far more rational procedure.

Uterine rupture is considered by many authors as of two types — one occurring through the top of the fundus and the other into the broad ligaments. It seems highly probable that many cases which have been diagnosed as rupture into the broad ligaments represent only tears through the contraction ring or the internal os, which can be better treated by repair from below than by hysterectomy from above.

In doing internal podalic versions, it will be of value to realize the true structure of the lower uterine segment. Let us also bear in mind that a contraction ring is a normal phenomenon, and exercise extreme caution in dilating it.

In cases of postpartum hemorrhage in which the uterus must be packed, it is far better to put tenacula on the contraction ring or internal os than to put them on the thinned-out cervix. This facilitates the packing and lessens the likelihood of exerting too great force on the weakened cervix.

The incidence of carcinoma of the cervix may, I believe, be materially lowered, in view of the findings here presented, if immediate cervical repair is more frequently done — provided the tear seems serious enough to demand operation. Furthermore, the new concept of the lower uterine

FIGURE 11.

A Lipiodol pack is in the uterine cavity, with the end of the pack in the cervical canal, showing that the cervical cavity has become completely obliterated. This plate was taken twenty-two hours post partum.

segment indicates that since there is a distinct need of the cervix in married women during the childbearing period, one should hesitate a long time before amputating it. Moreover the removal of so much muscular tissue in the process of repair as is now practiced seems to me a questionable procedure, and it would be far better to remove the mucosa and as little muscle tissue as possible.

I have also observed occasional cases of cervices

badly lacerated bilaterally, with erosion and eversion, probably owing to a delivery in which not only the cervix but also Bandl's ring was torn and the tear was carried up into what is really the cavity of the uterus. When during the first few hours after delivery the cervical cavity becomes the normal cervix, these extensive tears have made it impossible to secure proper apposition of the cervical parts. In cases of this type I believe that it is wiser not only to repair the lower cervix but also to take stitches through the internal os, in order to obtain a better cervical result. All these improvements may be expected to lower the incidence of carcinoma of the cervix.

In the light of the new concept, it becomes apparent how necessary it is to make an immediate diagnosis in cases of inversion of the uterus, and how relatively impossible it is to reduce the inversion from below unless the attempt is made at once. The presence of the contraction ring, it seems certain, also tends to prevent inversion of the uterus — except when it has been badly torn. Possibly one function of the normal contraction ring is to help in preventing prolapse of the cord — Nature's defense mechanism.

Many miscarriages in the early months, especially in cases heretofore classified as those of habitual abortion, may be due to some abnormality of the cervix which interferes with a normal physiologic process, thereby tending toward miscarriage. I wish to stress the fact that there is a so-called Bandl's ring in cases of early miscarriage, just as there is in every labor at the end of pregnancy, and that it is just as necessary and natural for a Bandl's ring to form in miscarriages as it is in full-term pregnancies. Many miscarriages the cause of which we have so far been unable to explain may well be early cases of placenta previa, caused by the muscle fibers' of the lower uterine segment being torn away from the placental site.

SUMMARY AND CONCLUSIONS

Proof has been furnished which appears to support the following theories:

What we have been accustomed to call the lower uterine segment is only what was the normal cervix before the onset of pregnancy.

The cervix is really taken up, and as a part of this process a ring is eventually formed, call it what we will: constriction ring, contraction ring or Bandl's ring.

This ring is a perfectly normal physiologic phenomenon, and has a distinct function in the process of labor.

The taking up of the cervix starts in the early days of pregnancy and continues even through labor.

Within a few hours after the end of labor the cervix is "taken down," and begins to resume its normal condition previous to the beginning of pregnancy.

There is present what we may term a cervical cavity but which is usually called the lower uterine segment. In order to prove this, it is necessary to make immediate postpartum examinations, since the cervical cavity cannot be demonstrated unless the patient is examined within the first few hours after delivery.

It is pointed out that since the lower uterine segment has been proved to be nothing but what was the normal cervix previous to conception, many present-day obstetric principles and procedures should be altered.

The first stage of labor may be described as consisting of two distinct parts: the taking up of the cervix and the dilatation of the external os. Since the external os does not begin to dilate until the cervix has been completely taken up and a ring has been formed, it is proposed to divide labor into five stages instead of the classic three, as follows:

(1) The taking up of the cervix.
(2) From the beginning of dilatation of the external os to its full dilatation.
(3) From full dilatation of the external os to birth.
(4) From birth to expulsion of the placenta.
(5) From expulsion of the placenta to the time when the cervical cavity has become completely obliterated and a normal cervix has been formed — a matter of only a few hours.

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ACUTE GONOCOCCAL TENOSYNOVITIS*

Report of Seven Cases

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ACUTE suppurative gonococcal tenosynovitis involving the flexor tendons of the hand has long been recognized as a clinical entity,[1] but reported cases have been very few, particularly those in English. Birnbaum and Callander[2] have reported 2 cases and reviewed the literature. Murray and Morgan[3] have reported 1 case and Cleveland[6] 2.

It is the purpose of this paper to report 7 cases and to describe methods of diagnosis and treatment. Five of these cases have been seen during the past eighteen months and constitute one third of the number of cases of acute tenosynovitis of all types seen during this period. The other 2 are the only other proved cases of gonococcal tenosynovitis found in the records of the Massachusetts General Hospital: 1 in 1903 and 1 in 1935. For cases with such etiology to constitute one third of all tenosynovitis cases seen in the past year is a surprising figure, and one may infer from this that acute gonococcal tenosynovitis is far commoner than case reports indicate. Other authors cited herein have expressed the same opinion. Further confirmation was found in a study of the records of the Massachusetts General Hospital for the last eight years. Eight out of 60 cases of acute tenosynovitis of all types definitely suggested a gonococcal etiology, although it was unsuspected by the surgeon and no apparent effort was made to identify the infecting agent.

The diagnosis of this type of tendon-sheath infection is of more than academic or bacteriological significance, because, as will be illustrated, the treatment of this and of other types should differ radically. If the disease is treated as though it were ordinary pyogenic infection the hospital stay may be prolonged and the end result poor.

ETIOLOGY AND PATHOLOGY

The etiology and pathology of gonococcal tenosynovitis have been well described elsewhere.[2] It may be noted, however, that the pus found in these cases is strikingly characteristic in appearance, being translucent, greasy and gray, exactly like that which may be seen pouring from the fimbriated end of a fallopian tube acutely infected with gonococci.

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DIAGNOSIS

The gonococcal etiology of acute tenosynovitis should be suspected in any case in which there is no history of antecedent trauma, in which there is a concomitant primary focus of gonorrhea and in which the signs and symptoms appear less severe than their duration would suggest. Nevertheless, in this series 1 patient developed such tenosynovitis following a cut of the finger, and in 3 others the presence of a primary focus could not be demonstrated; hence these factors should not be relied on exclusively in making a diagnosis. In each case the classical signs of acute tenosynovitis were present, but in only 1 case were they as outstanding as one would have expected had the infection been attributable to the staphylococcus or the streptococcus. Redness, tenderness, swelling and limitation of motion were always observed, but in only 1 case were they particularly severe, and it was noted that in some cases the infection appeared localized in only a part of the sheath rather than extending so as to involve the entire structure. The systemic reaction to infection as evidenced by fever and a high white-blood-cell count was in most cases slight.

Once the diagnosis of gonococcal tenosynovitis is suspected it may be established only by means of a positive smear or culture of the pus in the tendon sheath. Access to this may be had by means of aspiration with a syringe and hypodermic needle. This procedure is carried out in the operating room under aseptic technic. Anesthesia is not required. The puncture is best made through the center of the middle digital crease, at which point the tendon sheath is very superficial. Material thus obtained is smeared, stained and examined immediately, and before further exploration is instituted. Cultures should also be made.

Although this technic has been used in only our last 3 cases and was completely successful in only 2, the ease with which the diagnosis has been made in these cases justifies its use as the initial procedure to be followed in every case. Moreover, it appears probable that in the future most cases of gonococcal tenosynovitis will be diagnosed in this manner.

If the aspiration does not yield enough pus to make a clear-cut diagnosis by smear, or if for any other reason the diagnosis cannot be established

by this means, as in Case 6, an exploratory incision should be made under general anesthesia and with a tourniquet. Further smears and cultures are taken from the tendon sheath. If gonococci are found the incision is closed; if no organisms of any type are found and gonococcal tenosynovitis is strongly suspected, the incision may be closed and the result of the cultures awaited.

A word should be said as to the technic that has been found most satisfactory for culturing gonococci. Ascitic agar plates are brought to the operating room, and pus is streaked on them as soon as it is obtained. The plates are immediately placed in jars into which carbon-dioxide gas is blown. The jars are sealed and incubated. Cultures taken in this manner are almost uniformly successful.

TREATMENT

The optimal treatment for gonococcal tenosynovitis is immobilization with application of local heat, and not incision and drainage as is generally recommended. Kanavel,[4] Grinnell[5] and others have pointed out the danger of secondarily contaminating the incision used to drain a tendon sheath, not only at the time of operation but especially during postoperative dressings. Secondary infection will seriously alter the prognosis of gonococcal tenosynovitis. Furthermore, in a study made of the results of all types of incisions of the tendon sheath, a significant proportion of the poor end results were found attributable to scar contractures. Good results have been obtained by simply splinting the hand and applying local heat, but with the advent of sulfanilamide and the excellent results attributable to this drug in gonococcal infections it appears all the more evident that if a diagnosis of gonococcal tenosynovitis can be established, surgery is not only unwise but contraindicated. Cleveland[6] in 1923 commented on conservative treatment. He reported a case in which, following drainage of gonococcal tenosynovitis in one finger, the patient subsequently developed the same signs and symptoms in other fingers. These were not drained, and it was found that the lesions subsided with the application of local heat.

Obviously this optimal treatment can be pursued only if the diagnosis can be made by aspiration of the tendon sheath, unless the clinical picture is so clear, as on occasion it may be, that positive diagnosis can be dispensed with entirely.

Finally a word of caution should be added. It must be strongly emphasized that conservative treatment as outlined above should be instituted only if the gonococcal etiology has been established. The dangers of postponing incision and drainage of acute tenosynovitis caused by common pyogenic organisms are well known and have been emphasized by many authors. If real doubt as to the etiology exists, a case of acute tenosynovitis should be handled in the classic manner.

RESULTS

Fortunately, in the present series of cases the results have all been good. No serious permanent deformity has occurred because there was no secondary contamination in the cases that were operated on and the scar contractures yielded for the most part to physical and occupational therapy. It is probable, however, that they did well in spite of the treatment rather than because of it. One of Birnbaum and Callander's[2] 2 patients, who were treated by means of drainage, developed complete rigidity of the right forefinger, and Murray and Morgan's[3] patient treated in the same way lacked ability to extend the thumb completely.

In the 2 cases (Cases 5 and 7) which were diagnosed by means of aspiration of the tendon sheath the patients spent less time in the hospital and regained normal function of their fingers much sooner than did the others.

CASE REPORTS

Case 1 (M. G. H. 133857). N. D., a 3-year-old girl, entered the hospital August 29, 1903, with a 2 weeks' history of swelling of the left wrist, right forefinger and right foot and a vaginal discharge. The temperature was 101°F. and the pulse 160. Physical examination showed the finger to be extremely tender, swollen and painful on motion. A diagnosis of gonococcal tenosynovitis was made and operation advised. The entire length of the tendon was exposed through "infiltrated and edematous tissue" and a quantity of pus was found. This was cultured on hydrocele agar by Dr. Homer Wright, and a pure and abundant growth of gonococci developed. The wound was treated with corrosive dressings and the patient made an uneventful recovery. She was discharged September 18. One year later she was said to be without disease or deformity.

Case 2 (M. G. H. 350037). C. S., a 20-year-old, single salesgirl, entered the Emergency Ward December 4, 1935, with a 5 days' history of pain in the left index finger and left foot. There was no history of trauma. For the previous week she had had dysuria and a vaginal discharge. She admitted exposure 2 weeks before. The pain in her finger had increased considerably the day before entry, and she felt flushed and feverish. On entry the temperature was 103.5°F. and the white-cell count was 17,400 with 88 per cent polymorphonuclears. Physical examination showed heat, redness, edema and tenderness over the entire extent of the left forefinger. The bursae of the wrist were not affected. There was extreme pain on attempted motion. A cervical smear was found to be positive for gonococci. A diagnosis of gonococcal tenosynovitis was made, and operation performed. A flap type of incision as described by Auchincloss was made. The pus found was immediately smeared and gonococci were demonstrated. Accordingly a primary suture of the wound was done and the patient treated with immobilization and local heat. She made a complete recovery.

Case 3 (M. G. H. U91358). V. L., a 60-year-old widow, entered the Emergency Ward November 10, 1937. She complained of pain in her right 5th finger for 4 days. Six days before entry she cut her 2nd and 5th fingers over the proximal phalanges on the palmar aspect with a knife. Four days before entry she first noticed pain around the cut on her 5th finger. Despite hot soaks and poultices the pain grew worse and the finger began to swell. Physical examination showed slight edema and moderate tenderness over the two proximal phalanges of the 5th finger and the hypothenar eminence. The old cut appeared clean and not deep. There was no lymphangitis. The temperature was normal, and the white-cell count was 10,000. Small lateral incisions as described by Kanavel[4] were made. The pus found was smeared and cultured, but not on ascitic agar. No organisms could be demonstrated. Four days after admission, tenderness developed over the wrist joint; the temperature was 98.6°F., and the white-cell count 7000. On November 15, while preparations were being made to explore the bursae of the wrist, she developed a severe conjunctivitis. Smears from the eye were positive for gonococci. The patient was transferred to the Massachusetts Eye and Ear Infirmary for treatment. She was given sulfanilamide and all her lesions rapidly cleared. A month later she was noted to have a 45° flexion deformity. This has improved considerably with physical therapy.

It was this case that aroused our interest in gonococcal tenosynovitis. In the light of subsequent experience, the diagnosis might have been made much earlier than it was, and some of the complications and the deformity of her finger could have been avoided. This case was complicated by the preceding history of trauma, and clearly demonstrates the necessity of ever keeping a gonococcal etiology in mind.

Case 4 (M. G. H. U25955). J. O'L., a 32-year-old, single domestic, entered the Emergency Ward November 15, 1937, complaining of pain and swelling in the left 4th finger for 24 hours. One week before she had pricked a finger with a splinter; she could not remember which one. The day before entry she noticed pain and stiffness at the base of the left 4th finger. The pain rapidly became worse and she was unable to use her left hand. She denied exposure, and no symptoms of gonorrhea could be elicited. On entry the temperature was 99.6° F., and the white-cell count 12,000. Physical examination showed painful swelling over the proximal two phalanges of the 4th left finger and the adjacent web spaces. There was diffuse redness and the finger was held in semiflexion. Tenderness was maximal over the proximal phalanx. A cervical smear was negative. A midline incision was made and a smear showed gonococci. Sulfanilamide was given, and 2 days later a secondary suture was done. The complement-fixation reaction for gonorrhea was reported positive. The patient was discharged November 23. After discharge she developed a flexion deformity which was treated with a banjo splint. On February 23, 1938, she showed full range of motion of the finger.

Case 5 (M. G. H. U106318). W. N., a 23-year-old, single shoe worker, entered the Emergency Ward January 29, 1938, with a complaint of pain in his right 5th finger for 4 days. He had suffered no known injury, but the pain had become increasingly more severe and swelling had developed. One month previously he had first noticed dysuria and a urethral discharge. This was not treated. The temperature on entry was 100.6°F., and the white-cell count 16,000. Physical examination showed tenderness over the proximal part of the tendon sheath with the finger held in 40° flexion and considerable pain on attempted extension. There was moderate edema. Coursing up the forearm as far as the elbow were several streaks of lymphangitis. The general impression given was that of typical acute tenosynovitis, but all observers agreed that the signs were less acute than one would expect with a duration of 4 days. A diagnosis of gonococcal tenosynovitis was made and aspiration with a syringe and hypodermic needle was attempted. Through the middle digital crease it was found easy to withdraw a few drops of gray, greasy pus. A smear of this showed abundant gonococci. Accordingly the hand was splinted, local heat applied and sulfanilamide administered. The urethral smear was also found to be positive for gonococci. In 4 days the patient was entirely asymptomatic, and he was discharged February 4 as cured. On June 4 no abnormality was noted.

Case 6 (M. G. H. U140746). V. J., a 25-year-old housewife, entered the Out Patient Department July 18, 1938. She stated that she had awakened 8 days previously and found her left 3rd finger in semiflexion and very painful to extend. There was no history of trauma. She treated her hand with heat at home, but there was no improvement. No history of gonorrhea could be obtained. Physical examination showed the finger to be held in 70° flexion and to be edematous. There was tenderness over most of the tendon sheath. The temperature was 98.8°F., and the white-cell count 9300. The impression gained was that this infection was almost surely gonococcal in origin. In addition a cervical smear showed gonococci. Aspiration of the tendon sheath as described above was attempted. The smear thus obtained was thought to show gram-positive cocci. With this unexpected finding it was thought wisest to make an exploratory incision. This was done through a small flap incision and greasy, gray pus obtained. Smears of this showed no organisms at all. (It was later found that the first smear was treated with old precipitated stain which explains the puzzling findings.) Accordingly the wound was not drained but closed. Splints and local heat were applied and sulfanilamide was administered. Cultures on ascitic agar under partial carbon-dioxide tension had been taken, and in 36 hours an abundant growth of gonococci was obtained. There developed an arthritis of the wrist, which cleared quickly under treatment, and the patient was discharged July 27 with the wound well healed. She had, however, a slight flexion contracture which should ultimately respond to therapy.

In this case the clinical picture was so typically that of gonococcal tenosynovitis that had the aspiration smear shown no organisms conservative treatment would have been instituted.

Case 7 (M. G. H. U186515). B. D., a 27-year-old housewife, entered the Out Patient Department April 10, 1939, with a letter from her physician requesting treatment for tenosynovitis. One week before she had twisted her left middle finger, causing a slight abrasion near the tip. Five days before she had noticed a sudden onset of pain, which increased gradually, so that 24 hours before entry the pain had become intolerable. During this time she had noticed increasing swelling and redness involving the entire finger and spreading somewhat over the rest of the hand.

Her past history was suggestive of gonorrheal infection, but two cervical and urethral smears were found to be negative.

At entry the left hand was edematous and red, particularly the 3rd finger, which was tense and held in 40°

flexion. There was exquisite tenderness along the course of the tendon sheath and slight tenderness over the palm of the hand. Attempted extension of the finger caused severe pain. The temperature was 99.8°F., and the white-cell count 11,600. A diagnosis of gonococcal tenosynovitis was made. Aspiration of the tendon sheath as described above was done. Immediate smear showed numerous gonococci. Cultures taken at the same time resulted in a pure culture of gonococci 36 hours later. The arm was splinted and poulticed and sulfanilamide was administered. In 5 days the hand appeared entirely normal. The patient was hospitalized for 2 additional days, however, as she had developed a leukopenia of 1200. This became normal on cessation of the drug.

SUMMARY

Gonococcal tenosynovitis is undoubtedly far more prevalent than is commonly believed. It is probable that most such cases in the past have been undiagnosed and treated as being of ordinary pyogenic origin, with resultant long periods of economic disability. The value of an immediate smear of material obtained from the tendon sheath has been pointed out. Such material may be obtained by needle aspiration or an exploratory incision with primary closure. The treatment should be conservative rather than incision and drainage.

Seven case reports are presented.

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AGRANULOCYTOSIS CAUSED BY SULFANILAMIDE*

Report of a Recovered Case

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WE REPORT a case of agranulocytic angina following the use of sulfanilamide, and its recovery following transfusions and the administration of Pentnucleotide. There have been found in the literature 9 cases of this complication following the use of sulfanilamide with only 2 recoveries;[1] Long[2] writes that there have been 6 cases of agranulocytosis in the Johns Hopkins Hospital, with 2 recoveries. Undoubtedly there must be a greater incidence of this complication in sulfanilamide therapy than has been reported.

CASE REPORT

J. J., a 23-year-old, married waitress, was admitted to Rutland State Sanatorium June 14, 1938. One brother died of tuberculosis in November, 1937. Otherwise the family history was non-contributory. The patient had had pneumonia in childhood and bronchitis in 1934. The onset of catamenia occurred at 16. The menses were irregular until after the birth of a normal girl in September, 1935, when they became regular. There was a slight discharge postmenstrually; otherwise menstruation was normal. The patient had had cough, expectoration and lower abdominal cramps for 1 year previous to admission. The case had been diagnosed as pulmonary tuberculosis, Stage 1.

TABLE 1. *Summary of Blood Findings.*

DATE	RED BLOOD CELLS	HEMOGLOBIN	HEMATOCRIT	TOTAL	POLYMORPHONUCLEARS		WHITE BLOOD CELLS LYMPHOCYTES	MONOCYTES	EOSINOPHILS	BASOPHILS	MYELOCYTES	UNCLASSIFIED	SEDIMENTATION RATE	ICTERIC INDEX
					Total	Band								
	$\times 10^6$	gm.	%	$\times 10^3$	%	%	%	%	%	%	%	%	mm./min.	
June 15	4.4	12.5	45	8.7	67.0	5.0	19.5	9.5	3.5	0.5	0	0	0.1	8
July 29	—	—	41	4.9	66.0	28.5	11.5	22.5	0	0	0	0	0.6	—
August 15	3.3	8.8	26	3.6	55.0	19.5	33.5	10.0	1.5	0	0	0	1.0	25
August 17	2.6	7.8	—	1.6	14.0	1.0	82.0	3.0	1.0	0	0	0	—	—
August 19	3.1	9.2	—	1.9	0	0	96.0	1.0	0	0	0	3.0	—	—
August 24	3.1	10.2	—	2.2	30.0	15.0	33.0	16.0	0	0	17.0	4.0	—	—
September 8	3.8	—	—	11.3	68.0	5.5	26.5	4.0	1.0	0.5	0	0	—	—

On admission to Rutland State Sanatorium, Rutland, Massachusetts.

Artificial pneumothorax had been instituted by a private physician prior to admission.

From admission to July 26, 1938, the patient ran an afternoon temperature of 99 to 99.2°F. During this time she continued on bed rest and artificial pneumothorax. She complained of mild cramps across the lower abdomen on several occasions but seemed to be suffering from no acute illness. The red-blood-cell count on admission was 4,400,000, and the white-blood-cell count 8700 (Table 1).

On July 27 the patient complained of pain in the posterior thorax which radiated to the left flank. The temperature rose from 98 to 101°F., the pulse from 80 to 120, and respirations remained at 20. Fluoroscopy showed no pleural effusion. The pain had meanwhile shifted across

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the abdomen on a level with the umbilicus. There was loss of appetite but no nausea, vomiting or diarrhea. Physical examination of the abdomen showed no masses, tenderness or spasm.

On July 28 a vaginal examination was done. The cervix was normal; a small amount of blood was seen in the vagina. The patient had completed her menses on the previous day. The vaults were tender to manual examination but no masses were felt. The white-cell count was 5600.

On July 29 the patient complained of chills, general malaise and pain in the lower abdomen. Vaginal examination showed marked tenderness in both vaults, more on the left; there was a copious, purulent, foul discharge from the cervix. Smears of the latter showed numerous gram-positive and gram-negative organisms but none characteristic of the gonococcus. The blood culture was negative. At this time a diagnosis of acute pyogenic bilateral salpingitis was made, and sulfanilamide treatment was instituted (Fig. 1). During the next 2 days the dose was 5.3 gm., and for the 3rd day 5 gm. The temperature returned gradually to normal on the 4th day and remained there for the next 2 days. The white-cell count rose to 6900 and the patient felt better.

On August 1, 4 days after beginning the sulfanilamide, the patient complained of dyspnea. Cyanosis was marked. The drug was reduced to 1 gm. On August 2 the dose was increased to 2.4 gm. and the cyanosis lessened markedly.

On August 3 the patient complained of chills, general malaise and lower abdominal pain. The temperature was 99.4°F., the pulse 100, the respirations 20, and the white-cell count 9100. Sulfanilamide was continued, with 2.4 gm. daily. The cyanosis did not return. The patient, however, became more toxic, and had several chills, severe prostration and night sweats and continual pain in the lower abdomen. The temperature remained septic (from 102 to 104.6°F.). The white-cell count steadily increased to 16,500 on August 8, 11 days after sulfanilamide treatment had been begun. On August 9 the high levels of temperature began to recede, but the patient was still very ill and no clinical improvement was noted. On August 11 the white-cell count was 8550, and red-cell count 3,500,000, and the hemoglobin 10 gm. Two days later the white-cell count was 6450 with 79 per cent polymorphonuclears, the red-cell count 3,000,000 and the hemoglobin 8.2 gm. The icteric index was 30. The patient was definitely jaundiced for the first time. There was no angina. A transfusion of 500 cc. of citrated blood was given. Sulfanilamide had been continued, but the dose was cut to 1 gm. daily.

On August 15, 18 days after beginning sulfanilamide therapy, the white-cell count was 3550, with 55 per cent polymorphonuclears, 33 per cent lymphocytes and 10 per cent monocytes. The sedimentation rate was 1.0 mm. per minute, and the icteric index 25. The drug was discontinued on the following day.

On August 17 the red-cell count was 2,600,000, the hemoglobin 7.8 gm. and the white-cell count 1600, with 14 per cent polymorphonuclears, 82 per cent lymphocytes and 3 per cent monocytes. Five hundred cubic centimeters of citrated blood was given. From August 15 to 17 the temperature ranged from 97.2 to 98.6°F. and the pulse from 80 to 90. The patient felt much better.

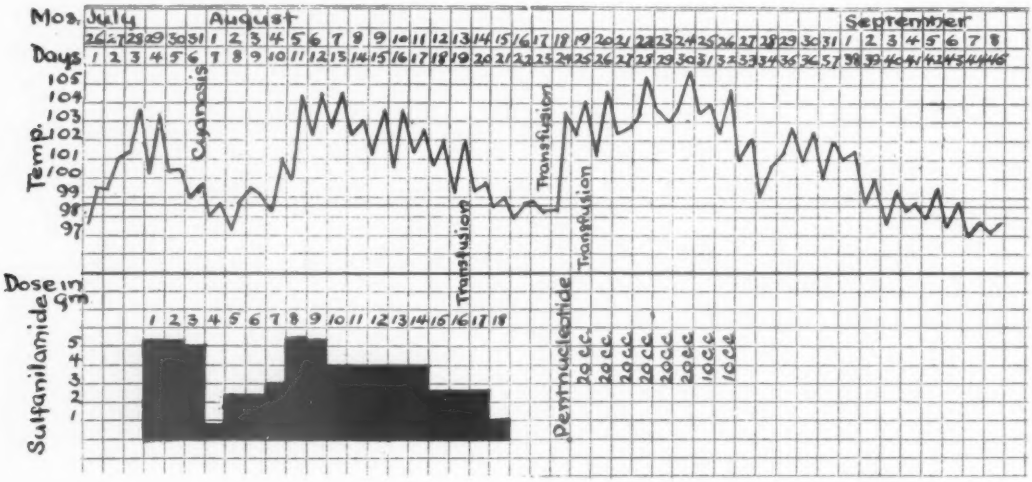

FIGURE 1.

On August 18, the 21st day, the patient had a chill and a sudden rise in temperature to 103.5°F.; the pulse was 130, and respirations 24. She was prostrated, sweating profusely, and for the first time complained of a sore throat. Examination of the throat revealed only a slight injection of fauces. The red-cell count was 2,900,000, the hemoglobin 11 gm. and the white-cell count 2600, with 1 per cent polymorphonuclears, 95 per cent lymphocytes, 1 per cent monocytes and 3 per cent unclassified. A diagnosis of agranulocytosis was made and 10 cc. of Pentnucleotide was promptly given. An addition of 5 cc. was given in divided doses on the same day.

During the next 5 days the red-cell count and hemoglobin remained constant at about 3,300,000 and 9.5 gm., but the white-cell count dropped to 1050, the lowest point recorded during the illness. During this time there were no polymorphonuclears in any smears. On August 19 a third transfusion of 500 cc. of citrated blood was given. Two 10-cc. doses of Pentnucleotide were given daily. Suddenly, after 6 days of absolute agranulocytosis, on August 24, the 7th day after Pentnucleotide had been first given, the differential white-cell count showed 30 per cent polymorphonuclears, 33 per cent lymphocytes and 16 per cent monocytes. The total white-cell count was 2200, the red-cell count 3,100,000, and the hemoglobin 10.2 gm.

From this day on there was a rapid improvement. The temperature descended gradually, reaching normal on September 3. The white-cell count rose rapidly each day,

reaching a peak of 42,400 on August 28, or 5 days after the initial rise. The polymorphonuclears also rose rapidly to 82 per cent on the 7th day. The Pentnucleotide was discontinued on August 27, or 9 days after the first dose.

On September 2 the patient complained of pain in the right loin and right upper quadrant of the abdomen. The impression was that a perirenal abscess was developing. However, all symptoms subsided in a few days.

On September 6 the patient presented a large discharging abscess of the right Bartholin's gland, which was incised and drained, and healed in a few days. Thereafter the patient had no complaints. The temperature remained normal. The blood assumed a normal picture, the last examination on November 1 showing a red-cell count of 4,600,000, a hemoglobin of 15 gm., a white-cell count of 6100 with 58 per cent polymorphonuclears, 31 per cent lymphocytes, 5 per cent monocytes, 5 per cent eosinophils, and 0.5 per cent basophils, a sedimentation rate of 0.1 mm. per minute, and an icteric index of 5.

There are several phases of this patient's illness which deserve comment. The relation between the temperature and the white-cell count was particularly significant. As soon as sulfanilamide was given the temperature gradually came down to normal on the fourth day. The white-cell count meanwhile increased gradually from 4900 to 9100. The temperature began to rise again gradually for the next five days and the white cells showed a gradual increase to 16,550 and then began a steady decline, as did the temperature. The patient was very ill. On three days, the eighteenth, nineteenth and twentieth days after sulfanilamide had been begun, the temperature was normal but the white-cell count fell to 1600. There was a sudden rise of temperature to 103°F. on the twenty-first day. The patient complained of sore throat at this time, and the white-cell count was 2600. The temperature was septic during the next eight days, during which time the agranulocytopenia disappeared and the white-cell count rose to 42,400. The temperature did not return to within normal limits until a Bartholin's abscess had been incised on the fortieth day.

Accompanying the neutropenia was a moderate hemolytic anemia. The initial red-cell count on June 15 was 4,400,000, and the hemoglobin 12.5 gm. The lowest drop was recorded on August 17, the red-cell count being 2,600,000 and the hemoglobin 7.8 gm. Transfusions of 500 cc. of citrated blood were given on three occasions.

A transient jaundice lasting only two days was noted on the seventeenth day after the start of sulfanilamide therapy.

In this case it will be seen that the leukocyte count began to fall on the fourteenth day after sulfanilamide was first used. The fall was gradual thereafter, reaching its lowest point of 1050 on the twenty-third day. The drug was continued for three days after the first drop in white cells. It should have been stopped at the first decrease even though the count was 8500. The fact that the agranulocytosis began on the fourteenth day is in keeping with Keefer's[3] statement that this complication has never been known to occur before the fourteenth day.

SUMMARY AND CONCLUSION

A case of agranulocytosis following the use of sulfanilamide is described. The patient recovered after discontinuance of the drug and the administration of Pentnucleotide.

We stress most emphatically that patients receiving sulfanilamide should be closely watched for idiosyncrasies and toxic effects of its use, with a daily study of the cellular elements in the blood.

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REPORT ON MEDICAL PROGRESS

ALLERGIC DISEASES

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AS MORE information concerning the underlying principles and the mechanism of allergic diseases becomes available, diagnosis and management become easier. Allergy is a very dramatic phenomenon, but nothing about it should be regarded as strange or unexpected. Skin tests and a marked sensitiveness to serum are part of the picture of serum disease. The patient who has recovered from pneumonia has a positive skin test to the specific pneumococcus carbohydrate. Patients infected with ascaris show a positive skin reaction to ascaris extract. Finally, several investigators have shown that when animals or human subjects are treated with repeated doses of some foreign protein, a positive skin reaction to that substance can be developed. Allergy becomes a part of the normal process of immunity.

However, hay fever and asthma are hardly normal. Hill[1] says that babies first weaned to cow's milk can be shown to have a skin test to milk. However, the test is transient, and if repeated in a few weeks it is in most cases no longer demonstrable. On the other hand, other babies have a positive reaction to egg, and here the sensitiveness persists and expresses itself, perhaps by eczema with its characteristic distribution to face, elbows and knees. Eczema of this kind is called atopic because in this baby the allergy is abnormal; it is almost permanent. It depends on a factor or factors which are inherited. The family histories of such children often show allergy in the relatives.

Why do certain children or adults have eczema while in others the same inheritance and the same kind of exposure to foreign substances result in another form of allergy like hay fever or asthma? The answer is difficult, but the evidence indicates that certain tissues can become more sensitive than others. There are patients skin-sensitive to pollen who have hay fever, — common enough, — but there are others who have no nasal symptoms and whose only complaint is asthma limited to one time of year. The sensitiveness is more marked in one case in the nasal mucosa, in the other in the bronchial mucosa. The process called contact dermatitis is particularly interesting because here the individual has a sensitiveness which appears to be limited to his skin. The Indians knew that they could chew the leaves of poison ivy without trouble — their sensitiveness also was of the skin and not of the mucous membranes.

One practical value of these observations lies in the light which they throw on diagnosis. Skin tests are fallible in two directions. They are sometimes positive when there is no clinical evidence that the particular substances cause trouble, and sometimes negative when the patient is obviously sensitive. Now, it is thought that these negative tests depend on the fact that the patient's sensitiveness is limited to the mucous membranes. The idea is confirmed by a study of several patients who, during the first year of their hay fever, had no positive skin tests, but when studied in succeeding years were found to have skin tests of steadily increasing size. Waldbott and Ascher[2] have called attention to the unreliability of skin tests in the early stages of allergic symptoms.

Skin tests may be positive when there is no evidence that the patient is clinically sensitive. Pearson,[3] like us,[4] has found that positive tests occur in many normal controls. Rynes[5] studied 367 patients skin sensitive to various animal danders, and found only 24 per cent who were aware that animals had anything to do with their symptoms. Hill[6] tested 44 eczematous babies with house dust and feathers and found many positive reactions. Sometimes elimination of the dust brought improvement, but there were too many cases in which a change in pillows or a move to another house or to a hospital failed to bring relief. Hill lays stress on the distinction between sensitiveness of the skin and sensitiveness of the body as a whole.

The leukopenic index of Vaughan[7] has received some attention. Vaughan believed that when a person ate a specific food to which he was sensitive the total leukocytes in his blood dropped, whereas after the taking of foods to which there was no sensitiveness they rose. Loveless and her associates[8] tried to confirm the finding on patients known to be food-sensitive, but after a most scrupulous study (counting 800 white cells in each smear), she showed that the test was un-

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reliable. Perhaps the more recent suggestion by Squier and Madison[9] that the blood eosinophils increase after specific foods may prove to be a more helpful even if time-consuming aid in diagnosis.

If skin tests are subject to discrepancies and errors, how can a diagnosis be made? Only one method is reliable, and that is the history. At the present time one is forced to lean heavily on evidence which is circumstantial rather than direct, and to check by clinical experiments the possibilities suggested by the history. If one can take a careful history demonstrating all the circumstances under which attacks occur, the diagnosis will often appear. Dates are essential: they are accurate and hold good for all time. The phrase "seven months ago," occurring in a history written in February, 1934, requires a mental effort in order for the reader to place the event mentioned in July, 1933, and then one wonders whether July was really correct. In New England, the grass pollens come in June and the ragweed season begins in August. The fact that an attack, for instance, occurred in "July" may have a critical significance, and the reader wonders why the exact date was not set down in the first place.

Dust-free rooms are diagnostically important. Even the ordinary hospital ward is often helpful, for most of the extrinsic cases clear promptly there, the patient having escaped from a dust which was causing trouble at home. Incidentally, we need to know how the patient was during a vacation or during a business trip away from home. If he was free of his asthma, the fact may be of immense practical value unless perhaps it came at a time of year when he would have been better anyway. We must also be told the dates of the trip.

If a certain food is suspected, it is easy to test the theory by eliminating it and have the patient confine his diet to foods which are above suspicion and which can be so selected as to provide an adequate, palatable and practical diet.

Active treatment of sensitiveness — desensitization — is on the whole disappointing in its result, and little real progress in the method or technic has been made. Typical results in hay fever are set forth in a close analysis by Clarke and Leopold.[10] Specificity plays an important role, and good results require that the pollen selected for treatment shall be in fact the pollen which caused the symptoms. Treatment with horse dander will do no good if the asthma is caused by the dander of a cat. The tolerance of each individual is defined at a certain level beyond which an increased dose will produce a general reaction with increased hay fever, urticaria, asthma, abdominal symptoms or shock — one or other of these symptoms predominating in the particular case. The literature on constitutional reactions has been reviewed by Furstenberg and Gay,[11] and a study of the general reactions from ragweed treatment has been completed in our own clinic by Dr. Jeremiah E. Greene.[12]

What the treatment does to diminish the symptoms is not known, so that its form is difficult to define. Whether it should begin early or late, whether large doses or small doses should be given at longer or shorter intervals, are questions still without any sure answer. We have seen patients markedly benefited by three or four doses given just as the season started, and we have seen others who seemed to require an extended series of doses — fifteen or twenty. The problem of technic remains unsolved.

SERUM REACTIONS

The following case reported by Cohen[13] has been quoted elsewhere, but it is repeated here because it illustrates what can happen when mechanisms and symptoms which follow normally after the injection of foreign serum are overlooked.

> A boy was kicked by a horse and was given antitetanus serum. On the 6th day after treatment, he developed fever and urticaria, typical of serum disease and a normal consequence of the serum. On the 7th day, however, there occurred pain in the neck, limbs and jaws, also a part of serum disease, but unfortunately a diagnosis of tetanus was made and more antitoxin was given, this time intravenously. Even while the injection was being made, the patient went into shock and almost died. Ten hours later there appeared at the site of the venipuncture, a bluish-red, sharply demarcated area, swollen and painful. For 3 days, the patient was in extremis; the area in the arm became gangrenous and there was complete suppression of urine. Slowly, however, he improved. On the 10th day he died suddenly of an embolus from a thrombosed vein.

Such a typical Arthus phenomenon would have been prevented if the symptoms of serum disease had been better understood. The subject is always important, and always worthy of emphasis and repetition.

The treatment of serum disease with its urticaria, joint pains and fever has received little attention because, if left alone, the process rarely if ever becomes alarming or dangerous. However, Foshay and Hagebusch[14] have recently found that treatment with histaminase, a preparation derived from the intestinal mucosa and having the property of detoxicating histamine, can be given both in tablets by mouth and in ampules by intramuscular injection with very favorable results.

INTRINSIC ASTHMA

"All is not allergy that wheezes." In the winter of 1938-1939, a careful study[15] was made of a group

of cases in which the circumstantial evidence — the history — gave no indication of a sensitiveness to any common dust or food. One rather startling fact was that, in this intrinsic group, deaths from asthma had occurred in 20 (7 per cent) of the 283 patients, whereas no deaths from asthma had occurred in a second group consisting of over 2000 patients whose asthma was extrinsic and due to a hypersensitiveness to foods or dusts or both. One must mention, however, that the literature contains a few reports of deaths by accident after the injection of serums and extracts into patients who are exquisitely sensitive to them. This difference in mortality between the two groups is in itself good reason to consider that the two kinds of asthma are separate. The cases with intrinsic asthma fell into several groups. In some, a typical intermittent extrinsic asthma dependent on a sensitiveness, perhaps to a pollen or to an animal dander, had changed into a chronic persistent asthmatic state bearing no relation to environmental or dietary factors. In others, asthma occurred only with head colds. In a third group, the onset was sudden and usually after the age of forty. Finally, quite a few patients developed asthma as a sort of complication to a long-standing, severe and distressing, chronic vasomotor rhinitis.

There was a sub-group of these cases in which the blood eosinophils rose to a high level, — 75 per cent, — and evidence of vascular disease — hemorrhages from the lung, stomach and bowel and into the skin (purpura) — was added to the picture; the diagnosis was changed to periarteritis nodosa, the prognosis was grave and 50 per cent of the patients died. It is interesting that in each of the fatal cases serositis — pleurisy and pericarditis — developed. The report of them concludes: "When asthma of great severity is accompanied by a high blood eosinophilia and by pains and numbness in the extremities, the probable diagnosis is periarteritis nodosa."

In all these intrinsic cases, it has seemed proper to regard the asthma as part of a syndrome characterized by asthma, nasal sinus disease, eosinophilia and the peculiar malaise referred to as "allergic toxemia" — the condition as a whole being dependent on a hypothetical *x* factor. The idea was suggested by the literature on sinus disease in asthma, which is voluminous and controversial. Operations on the sinuses in chronic asthma yield results which are good for a time but almost always disappointing in the long run. Thus, about a third of all our own patients had already had one or more sinus operations before applying for further treatment, and about a half were found to have sinus lesions, varying from a pansinusitis to thickened membranes, with or without nasal polyps, at the time of examination. It seemed certain that the great frequency was in itself evidence that the sinusitis was a part of the picture and not a cause of it. Local treatment given with caution, so as to disturb the normal structure and function of the nose as little as possible, will do good. The removal of polyps and the clearing of the nose by suction of the sinus secretions may be helpful although such treatment may have to be repeated often. Whatever will stop the postnasal drip will benefit the tracheobronchitis.

Autopsies on patients who die of asthma without heart disease or pneumonia are uncommon, but the picture is always striking. The bronchi are found to contain an exudate of peculiarly tough, sticky material which fills the lumen, protruding above the cut surface, so that it can be grasped with forceps and pulled out in long shreds. No wonder the patient coughs and later literally suffocates. In the pharynx, a similar exudate may form either as a rope or as a thin veil over the pharyngeal wall, and if this can be pulled away by suction, the relief may be great.

What is the *x* factor in the background which sets the stage and explains why asthma occurs after such a variety of exciting causes as head colds, emotional stress, exposure to cold, fatigue or finally allergy? Why should histamine be regarded as the active end substance which results from many kinds of reaction and is, therefore, the immediate cause of asthma? There are several reasons. First, histamine is a normal constituent of the body cells and is released easily by injury to these cells (Sir Thomas Lewis[16]). Second, injection of histamine in persons subject to asthma induces an attack (Weiss, Robb and Ellis[17]). Third, histamine injected into guinea pigs causes symptoms like anaphylactic shock. Do patients have an excess of histamine in their systems, or are they deficient in the normal mechanism by which histamine is destroyed? Active work on these problems is going on in many clinics, with varying results. Meantime, other chemical effecters, such as acetylcholine, will be investigated, and the time may come when the treatment of asthma of whatever cause will be reduced to a fairly simple basis.

TREATMENT

In the meanwhile our patients need help, and treatment is important. The vitamins have been considered, but so far there is no valid evidence that they are concerned with the cause of asthma or that the feeding of them is helpful in treatment. Potassium chloride was first suggested by Rusk and Kenamore[18] as a treatment for urticaria, on the theory that an imbalance of potassium

plays a part. Epinephrine increased the potassium content of the blood serum, and potassium salts when injected intravenously had an effect comparable to that of adrenalin. These authors proposed in chronic urticaria a potassium regime with a diet low in sodium salts and high in meat and vegetables, and with potassium chloride given in doses as high as 6 to 10 gm. per day. This method might well be applied to some patients with chronic asthma, and reports of such treatment are appearing. Rusk et al.[19] find that the serum potassium is increased in asthma. They explain that in allergy the body cells are depleted of their potassium, which appears in the blood. The feeding of more potassium offsets the deficiency.

For acute attacks of asthma there are several remedies which are relatively new. In 1938 Keeney[20] advocated "slow epinephrine" — a suspension of powdered epinephrine in peanut oil. The oil provided for slow absorption and thus the effect of the drug was prolonged. The material is now available commercially. It is apt to produce local reactions of considerable size. In a recent article Keeney, Pierce, and Gay[21] discuss the results in practice, and report them as good.

Theophylline with ethylenediamine (aminophylline) is a purin compound which has been used as a diuretic in cardiorenal disease and now appears to be useful in asthma as well. The details concerning its application are described by Herrmann and Aynesworth.[22] In several of our cases the contents of an ampule containing 0.20 gm. in 10 cc. of water, injected intravenously, has brought marked and prompt relief to the paroxysms.

Helium and oxygen are advised by Barach,[23] who has written extensively on the method of administering the gases. A convenient apparatus is the Boothby-Lovelace-Bulbulian[24] (B-L-B) mask, which fits over the nose, leaving the mouth open enough for eating, drinking and talking. The gas mixture contains 20 per cent oxygen and 80 per cent helium, and its effect depends on its very low specific gravity compared with that of air. By suitable valves, tanks of helium-oxygen and of pure oxygen are connected to the mask so that as the patient improves more and more oxygen and less and less helium can be used. Barach asserts that the treatment helps to rest and soothe the local bronchial irritation. His patients are given inhalations at intervals during their convalescence. Maytum[25] describes the use of the method at the Mayo Clinic.

Bronchoscopy may be lifesaving. The sticky character of the exudate has been referred to above. The symptoms depend largely on this exudate, and its removal should cause prompt relief. Some authorities advocate the instillation of iodized oil at the time of bronchoscopy. This makes possible a further study of the lungs by x-ray, and the oil is said to have healing properties, but Flamm[26] reports 2 cases in which the oil became a true foreign body and the later situation was bad.

Finally, a word should be said about drug allergy. Most patients with severe asthma are sensitive to aspirin; one of our patients almost died from a 5-gr. pill. Many are sensitive to morphine, and we have learned to be extremely cautious in giving it to patients with severe asthma. Barbiturates are in the same class. Sensitiveness to them is easily acquired and several cases of ours were made far worse by such drugs as phenobarbital and Pentobarbital.

Unfortunately there is no test for drug allergy. Codeine always gives a positive skin reaction, but in all our patients with violent general sensitiveness to aspirin the skin test has been negative. So far the only way to determine sensitivity has been to use the drug, but the trial has not always been safe or easy. Atropine should theoretically be very helpful, but its practical results are disappointing. Our present plan is to use only those drugs which have a very simple chemical formula. The bromides, paraldehyde and chloral hydrate are all useful and appear safe. The injection of salt solution, a liter or more intravenously, with the addition of 5 or 10 per cent glucose, may be extremely helpful to patients who are dehydrated, sweating and toxic, and if necessary, 1 or 2 cc. of a 1:1000 solution of adrenalin can be added to the solution, but it must be mixed thoroughly with it. Finally, ether and olive oil by rectum is sometimes needed. Kahn[27] recommends a mixture of equal parts and injects from 150 to 200 cc. The general anesthesia which results is almost complete. An excellent paper on emergency treatment in asthma is that by Waldbott.[28]

* * *

It is the writer's opinion that progress in allergic diseases will become more advanced when the problems of allergy and of asthma are separated. Allergy is a phase of immunity and must be studied by immunological methods, with due regard to modifications produced by dietary and endocrine disturbances. Asthma is a problem of physiology and of pathology. In some cases, the hypersensitiveness of allergy appears to be an adequate explanation of the whole picture, but in many other cases, allergy falls short of the answer, and whereas new conceptions are being offered and considered, no one of them so far is good enough. Real progress in allergic disease awaits a discovery of the first magnitude.

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CASE RECORDS OF THE MASSACHUSETTS GENERAL HOSPITAL

ANTEMORTEM AND POSTMORTEM RECORDS AS USED IN WEEKLY CLINICOPATHOLOGICAL EXERCISES

FOUNDED BY RICHARD C. CABOT, M.D.

TRACY B. MALLORY, M.D., *Editor*

CASE 25321

PRESENTATION OF CASE

First Admission. A seven-month-old boy was brought into the hospital in July by his mother because the baby was undernourished and feeble. The parents were well. The patient was the youngest of twelve children, seven of whom were living. The family history was negative for syphilis, tuberculosis, heart trouble or familial diseases.

Birth was normal at term. He appeared a healthy baby. He was not breast fed, but received formulas of evaporated milk, water and Karo syrup up to within one week of entry to the hospital. Cod-liver oil and orange juice had never been given until one week previous to admission. The baby seemed to do well and gained weight until three months old; since then his weight had been practically stationary. He had had no infections or gastrointestinal disorders. His appetite was good, and there was no pica. He held up his head at four months but was unable to sit without support at seven months.

Physical examination showed an alert, mentally active, pale, feeble-looking baby. The muscle tone was poor, and subcutaneous fat was conspicuously absent. There were no teeth. The wrists were not enlarged. The head was of normal circumference (42.5 cm.) and the length of the body 61.3 cm. (normal, 65.0 cm.). The abdomen was protuberant, and a Harrison's groove was present. The heart was not believed to be enlarged. A blowing systolic murmur was heard all over the cardiac area but best at the apex. The spleen and liver were palpable one fingerbreadth below the costal margin.

The blood examination showed a white-cell count of 12,700 with 44 per cent polymorphonuclears, and a red-cell count of 4,510,000 with 50 per cent hemoglobin, 52 per cent lymphocytes and 3 per cent monocytes. The red cells showed some hypochromia. The urine was normal, the stools normal. A tuberculin test was negative. The blood Hinton test was negative. An electrocardiogram showed a diphasic QRS complex and an inconstant inverted T_1. X-ray examination of the chest showed no evidence of scorbutic beading of the ribs. The heart was increased in size and abnormal in shape, the right side being particularly prominent. At expiration the heart assumed a more normal shape.

The child was given a formula of whole milk, water and cane sugar, and plenty of thiamine chloride, ascorbic acid and cod-liver oil. Elixir of ferrous sulfate was also given. The solid food included cereal, bananas, toast and vegetables. The hemoglobin rose to 70 per cent, but in spite of getting 50 or 70 calories per pound a day, his weight in eight weeks increased only from 11 pounds, 2 ounces, to 11 pounds, 5½ ounces. He took his food well and showed no evidence of indigestion. Two basal metabolism tests done one week apart were reported +63 and +49 per cent. Mentally he stayed alert but did not increase his voluntary activity. The heart murmur persisted. There were no eye signs or tremor, and the thyroid gland was not palpable. Potassium iodide, 3 drops daily, had no effect on his weight. He was discharged to a convalescent home eight weeks after entry.

Second Admission (two months later). At the convalescent home he gained 2 pounds. He was in the hospital another three weeks without gain in weight. His basal metabolism was +42 per cent. The hemoglobin was 70 per cent, and the white-cell count 11,000. The child's nutrition seemed better. The size of the heart was unchanged or slightly smaller. A cardiac consultant reported marked cardiac enlargement, a harsh systolic murmur and thrill at the left of the lower sternum and a blowing systolic murmur at the apex. T_1 was no longer inverted. He was discharged in three weeks.

Third Admission (twelve days later). The child was re-admitted because of apparent pain and a temperature of 104°F. Physical examination disclosed a red throat and rapid, regular respirations. Examination of the ears was negative. The lungs were clear. X-ray films showed no change in the size of the heart. A white-cell count was 18,000 with 47 per cent polymorphonuclears. The temperature fell in eighteen hours and remained normal. The child was sent home after one week in the hospital.

Final Admission (three months later). He had been seen in the Out Patient Department for colds and had gained 12 ounces during this period. He was said to have cried considerably and was believed to have been spoiled. Three days previously, he contracted a slight cold. On the day of admission he became very sick, developing a cough, mucus in the throat and noisy wheezy respirations.

Physical examination showed him to be cyanotic,

restless and breathing rapidly. Rhonchi were heard over the chest, obscuring the heart sounds. The liver was three fingerbreadths below the costal margin. The temperature was 103°F., the pulse 200, and the respirations 100. The white-cell count was 11,000. He was put in an oxygen tent but died a few hours after admission.

Differential Diagnosis

Dr. Eli C. Romberg: This is a rather complicated case with a few facts that are disturbing. I do not know whether this is a recent or old case because here we have a family of twelve children which so rarely occurs now. I think we have to discuss, then, a child who at seven months of age has the weight of a two- or three-month-old infant, who is feeble and does not gain in weight in spite of apparently properly digested food and no history of diarrhea or vomiting and who presents, as his chief abnormalities, a large heart with murmurs that have been described and a basal metabolic rate that persistently ran high.

Before I discuss the heart, which seems to me the most important feature in this case, I want to consider the significance of the high metabolic rate which this infant showed. It states that the metabolic rate varied from +42 to +63 per cent. I do not know whether it was computed on the basis of the weight and height of the infant. These facts must be considered. I bring up the question of metabolism now because this was a child who had not gained in spite of a sufficient caloric intake. Hyperthyroidism in infancy is extremely rare. I think the youngest I have seen verified by operation was five years of age, but there are several cases of hyperthyroidism in infancy that have been reported. Dr. Paul D. White describes one in very early infancy and another case at about nine months of age. How, then, can we explain the high metabolic rate? The child had no tremors, no extraordinary palpitation, no nervous symptoms or no exophthalmos, and many other findings are against hyperthyroidism. I personally do not think that this child had hyperthyroid disease. We do find, and I think Dr. Higgins will bear me out, that in certain poorly nourished children and sometimes in premature infants a high metabolic rate may be found without having hyperthyroid disease present. On that basis I am going to dismiss the high metabolic rate as evidence of thyroid disorder and assume that it has no diagnostic significance in a child who is markedly underweight and has a marked circulatory disturbance.

The heart showed a murmur that was systolic in time and heard all over the chest. There was right-sided hypertrophy. The size of the heart and the character of the murmurs could be explained on the basis of a mitral regurgitation, except that this was a child who was perfectly healthy and was suddenly found to have a loud murmur as described without any history of rheumatic fever or any other sudden infection that might bring about this condition. Dr. White has recorded cases of intrauterine mitral involvement or mitral lesions that have been discovered around one or two years of age. However, because of subsequent findings and because of the age of the child I shall not consider the possibility of a mitral lesion.

What lesion can this be? The most likely is one due to a congenital heart. One of the commonest conditions in children is a patent interventricular septum, but such a lesion does not ordinarily give an enlarged heart. There may be some enlargement but not the conspicuous right-sided enlargement here described. The murmur, at least as described, was maximum at the apex. Ordinarily the systolic murmur of a patent interventricular septum does not have its point of maximum intensity there. It is nearly always found maximum substernally near the third or fourth interspace. We see many cases of interventricular septal defects in infants and children, but most of these patients are symptomless and are only discovered in the course of an examination. So there must have been some superimposed complicating factor.

What other conditions can give an enlarged heart in children? I shall just mention a few and discuss them briefly. I imagine that they thought of Von Gierke's disease, described in 1929; this condition is essentially due to a carbohydrate metabolic disturbance with a storing of glycogen in the heart, liver or kidneys, giving the hepatonephromegalic type or the cardiomegalic type, as they probably suspected here. In this condition you have a patient, normal at birth, with a retardation of development, difficulty in feeding, and weakness of the muscles. He does have frequent respiratory infections, and these may be the cause of the death. X-ray study shows a greatly enlarged heart, spherical in shape, and this seems to fill the entire left cavity. He has a secondary anemia of the hypochromic type and a slightly elevated leukocyte count, with a tendency to leukocytosis. On the ward they probably did not think much of this possibility because they did not report some of the confirmatory tests that are usually done, such as sugar tolerance tests and those to measure the blood-sugar response to injections of epinephrine and to determine any disturbance in pancreatic function. This possibility, however, can be dismissed, for the heart does not appear

to be enlarged in the proper way and other findings are contradictory.

The child did not have any added vitamins in the diet so one could consider the possibility of avitaminosis. Later, however, the child was given plenty of thiamine chloride, ascorbic acid and cod-liver oil and apparently did not improve.

I believe the most likely cause of this condition is congenital heart disease, and I suspect involvement of the pulmonary artery as at least partial explanation of the right-sided hypertrophy. Sudden terminal tricuspid insufficiency might account for the sudden increase in the size of the liver and the abdominal pain as described here. I am sure that if the patient did have an interventricular defect it was not very extensive.

Dr. Harold L. Higgins: Every once in a while we see a baby that eats well and digests its food perfectly but still does not gain in weight. This baby fell into that group. He was a very thin child. In these cases we have found the metabolism increased sometimes to as high as +80 per cent, based on the height and weight standards. This condition as a rule is outgrown about the time the babies are a year of age, when they start to gain in weight normally. This baby, however, had an added complication, a congenital malformation of the heart. I was of the opinion that there was a patent interventricular septum, with hypertrophy of the heart; as a result of the respiratory infection, the heart decompensated and the child died.

Dr. Edward F. Bland: I saw this child on the first admission, but not during the subsequent course. The child was feeble and poorly nourished. One thing that struck us was the marked secondary anemia. Another striking finding was the degree of enlargement of the heart together with the loud systolic murmur. At that time we were not quite willing to decide whether it represented an uncomplicated congenital lesion or whether the dilatation and murmur were in part secondary to the malnutrition and anemia. We considered both possibilities, with an interventricular septal defect as the most likely congenital anomaly.

The child apparently died of a severe infection. The heart had done its job fairly well until the last episode, which brings up the possibility of a terminal bacterial endocarditis.

Clinical Diagnoses

Acute upper respiratory infection.
Congenital malformation of heart.

Dr. Romberg's Diagnosis

Congenital heart disease:
? patent interventricular septum.
? pulmonary stenosis.
? tricuspid insufficiency.

Anatomical Diagnoses

Congenital anomaly of the heart: patent interventricular septum, tricuspid insufficiency.
Hypertrophy of the heart.
Bronchopneumonia.
Malnutrition.

Pathological Discussion

Dr. Tracy B. Mallory: The autopsy on this child showed a very considerably enlarged heart, and the main defect in it was a patency of the interventricular septum. There was a hole nearly 2 cm. in diameter. There was one other finding, however, which may perhaps have been of some importance and help to explain the unusual enlargement which bothered Dr. Romberg in this case. One of the leaflets of the tricuspid valve passed through the interventricular septum and was anchored in the left ventricle instead of the right, pulling one leaflet tight against the ventricular wall and appearing to produce an incompetent tricuspid valve as well as the interventricular septal defect.

The terminal event was an extensive bronchitis with beginning pneumonia and quite a bit of atelectasis, as is usual in children. Whether the bronchitis alone was responsible for the severe terminal cyanosis or whether this child developed a sudden shunt from the right side of the heart over to the left, as frequently happens, cannot be decided on anatomical grounds. There was certainly no abnormal glycogen deposit either in the heart or liver and von Gierke's disease can be ruled out.

Dr. Higgins: Does this explain the enlargement of the liver — provided it was enlarged?

Dr. Mallory: The liver was moderately enlarged, I assume from the acute passive congestion of the terminal episode.

In my opinion, one possibility in regard to an elevated metabolic rate in patients with cardiac lesions always has to be considered. There may be a considerable degree of anoxemia, inadequate to show up as cyanosis but nevertheless great enough to use up quite a little oxygen in bringing the hemoglobin saturation up to normal. If you do not make allowance for that by keeping the patient in a high oxygen atmosphere for some minutes before beginning to measure the oxygen consumption you may get a falsely elevated metabolic rate.

CASE 25322

Presentation of Case

First Admission. A forty-two-year-old American housewife was admitted to the hospital complaining of an abdominal tumor and abdominal discomfort.

The patient was apparently well until twenty-eight months before admission when she noted the onset of attacks of vague non-radiating, moderately severe pain, located in the right mid-abdomen, and unassociated with food, bowel habits or the menses. At their inception these attacks lasted for a minute or more, then increased in length until sixteen months before entry when they persisted for one week or more at a time. Five months before entry she had noticed a mass in the abdomen and had consulted a physician, who explored her abdomen and removed a piece of tissue for examination, the result of which she never heard. Following this operation she stated that she felt as though she were pregnant; she suffered frequent gaseous eructations, nausea and occasional vomiting of recently ingested food. She had never had bloody or tarry stools. She had lost about 50 pounds in weight. The family, marital and past histories were noncontributory.

Physical examination revealed a well-developed, pale, very anemic woman. There was a lower abdominal right rectus scar. The right side of the abdomen was enlarged by a mass about 20 cm. in diameter, oval in shape, with one end appearing under the right rectus scar and the other in the right costovertebral angle. The mass seemed to be just beneath the abdominal wall, was hard, smooth and tender in places and did not move with respiration. It could not be moved manually. The rectal examination was unsatisfactory because of painful external hemorrhoids. Pelvic examination revealed the uterine fundus to be enlarged to the size of a large grapefruit by what appeared to be fibroids. It was freely movable. The fundus was pushed to the left and the cervix to the right by the abdominal tumor. There did not seem to be any connection between the tumor and the uterus.

The blood examination showed a red-cell count of 2,600,000 with 60 per cent hemoglobin, and a white-cell count of 8100. The urine and stool examinations were negative. X-ray examination showed a large mass extending into the lumen of the cecum and ascending colon.

A resection of the cecum and ascending colon with lateral anastomosis between the terminal ileum and transverse colon was performed. There was no evidence of metastasis to the liver, though the growth had infiltrated into the muscles of the back. The pathological report on the specimen was colloid adenocarcinoma. Following this her postoperative course was uneventful and she was discharged three weeks later.

Second Admission (thirteen years later). Six months after discharge the patient completed a series of x-ray treatments consisting of 400 r to the pelvis, both anteriorly and posteriorly. Three years later a gastrointestinal series and barium enema were negative. The following year she was seen in the medical outpatient department and given a diet for weight reduction because of obesity and hypertension. A Graham test was positive. Four years before entry, pain in the inner quadrant of the right breast was diagnosed as being due to chronic cystic mastitis. Two years before admission she was seen in the Tumor Clinic and a 5-cm. hard, tender mass palpated in the left lobe of the liver just to the right of the midline. A Graham test was refused. One year later the mass previously described seemed to be along the ensiform rather than in the liver. She complained of nausea and vomiting after breakfast, and a low backache over the right sacroiliac region which was increased by standing and relieved by the application of a supporting belt.

Two months before admission she had a sudden recurrence of nausea, vomiting and intense pain in the right sacroiliac region and in the right lower quadrant. The attack lasted five or six days. A mass was palpated in the right lower quadrant. Following this episode she felt better and had only occasional twinges of pain. She carefully avoided fatty and fried foods and took bile salts when distressed.

Physical examination revealed a well-developed, obese woman in no acute distress. A very tender, irregular firm mass filled the entire right upper quadrant. There was exquisite tenderness in the region of the gall bladder. The blood pressure was 110 systolic, 60 diastolic.

The temperature was 99.6°F., the pulse 96, and the respirations 20.

The urine examination was negative. The blood showed a red-cell count of 4,100,000 with 70 per cent hemoglobin, and a white-cell count of 8200. X-ray findings revealed the presence of a large tender mass measuring approximately 15 by 8 cm. which filled the lateral side of the abdomen. The amputated tip of the colon appeared to be infiltrated with tumor.

On the twelfth hospital day an operation was performed.

X-Ray Interpretation

Dr. Richard Schatzki: The original films of thirteen years ago are no longer available. Here are some films taken nine years ago which show that the right side of the colon had been amputated, with the anastomosis between the ileum and colon near the hepatic flexure. Finally, these are the films which were taken on the last admission. At first glance you wonder where the big mass is that was described in the report, but when you

look closely you see that there is something wrong in the region lateral to that in which the ascending colon would be if it had not been resected. There is a large soft-tissue mass which must have bulged outward in the flank, and there seems to be definite evidence of involvement of the operative stump by this mass.

Differential Diagnosis

Dr. Marshall K. Bartlett: As a starting point we have a patient who had a tumor removed thirteen years before admission, the nature of which we know from the pathological report to be colloid adenocarcinoma. She was readmitted thirteen years later, with a large firm tender mass in the right side of the abdomen. There are two questions that we have to decide: first, whether this mass is inflammatory or neoplastic, and secondly, if it is a neoplasm, whether it is a recurrence of the old growth or a new tumor. Looking over her symptoms in the interval between admissions we find that she was well for a long time, so far as symptoms referable to the abdomen go. Eleven years after her operation the tumor which was noted to the right of the midline and thought to be in the liver was first observed. That would be two years before admission. The next note is a year later at which time she began to have symptoms of nausea and vomiting. The interesting features are the intermittent nature of the pain in the right sacroiliac region and the attacks of nausea and vomiting. Looking back to the story before the first admission those are exactly the symptoms that she had then, and they are of the same intermittent character. Apparently the tenderness of this mass at the last admission was a very striking feature and naturally makes one consider the possibility of something besides neoplasm. Again it is noteworthy that the mass noted at first admission was also tender. It seems to me that with a known diagnosis of neoplasm thirteen years before, with a recurrent mass in the same general region and with the x-ray suggesting involvement of the stump of the bowel, it is very difficult to consider this anything but a neoplasm.

Must it be a recurrence of the original neoplasm? There is an interval of thirteen years between admissions, and an interval of eleven years before the mass was first noted in the region of the liver. Because of the long duration of symptoms before the first operation, I think it is fair to assume that this was a slowly growing neoplasm. Sixteen months elapsed between the biopsy that was done outside and the operation that was done here, and yet even with that long interval the growth was still locally operable with no evidence of metastasis. I should think with that evidence of slow growth it is reasonable to assume that the tumor might progress so slowly that it would be eleven years before a recurrence would be noted and on that basis I think it is more logical to assume that this was a late recurrence of the original neoplasm rather than a new tumor appearing in some other organ.

Dr. Richard H. Sweet: Dr. Daniel F. Jones, with an enormous background of experience, used to make the statement that colloid carcinoma always recurred, and knowing that this tumor was slowly growing, there is some evidence in favor of what Dr. Bartlett has said.

Clinical Diagnosis

Recurrent adenocarcinoma of colon.

Dr. Bartlett's Diagnosis

Recurrent colloid adenocarcinoma of colon.

Anatomical Diagnosis

Recurrent colloid adenocarcinoma.

Pathological Discussion

Dr. Tracy B. Mallory: At the final entry this patient was re-explored by Dr. Edward L. Young, who found a very extensive recurrence associated with perforation of the bowel, sepsis of the abdominal wall and various fistulous tracts running in several directions. It would have been quite impossible to remove it without taking out two thirds of the lateral abdominal wall and possibly even the right kidney. He backed out without attempting to do anything but a biopsy. The liver was still free from metastasis sixteen years after the time that we may assume that the cancer started. I think that even at the time of the original operation some surgeons less courageous than the operator, Dr. Lincoln Davis, might have questioned whether it was worth resecting the bowel, inasmuch as there was fairly extensive invasion of the posterior abdominal wall at that time. Yet she gained eleven years of excellent health from that operation, proving that it was thoroughly justified.

Dr. John D. Stewart: Did the local sepsis take the form of a definite abscess?

Dr. Mallory: There was a large irregular abscess.

Dr. Arthur W. Allen: Is it not very unusual to have colloid carcinoma remain quiescent as long as this one did?

Dr. Mallory: I should say so. I cannot remember any other case with such a long interval before recurrence.

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A WARNING!

While it appears likely that the indictment engineered by the United States Department of Justice and served against the American Medical Association, three other medical societies and twenty-one individual physicians for alleged violation of the Sherman Anti-Trust Act will not be upheld if carried to the Supreme Court, the fact that a governmental agency saw fit to sponsor such an indictment offers food for thought regarding the activities of organized medicine.

There can be no doubt of a national trend toward "socialization"; by this we do not mean socialism, but rather social security or an improvement in conditions which affect the physical and mental welfare of *all* the people. National and state legislation to this end has been passed, additional changes have been proposed, and undoubtedly the people — the voters — will demand even more. Just how far this can be carried in these United States without destroying the basic fundamentals that have been responsible for the unusual, even unprecedented, normal prosperity of the country, remains to be seen. It must be acknowledged, however, that many, but not all, of the changes and reforms have been long overdue.

In most sections of the country this does not apply to the general problem of medical care, if this can be judged by comparing morbidity and mortality statistics with those of other countries. Nevertheless no one can deny that the people in certain areas are not provided with adequate medical and hospital facilities, — either in the quantitative or qualitative sense, — that sickness creates a great economic burden and that the potential improvements in public health that can be gained through the application of proper steps in preventive medicine are enormous. The relative importance of these inadequacies and possibilities has undoubtedly been increased by the activities of a social-security-minded administration. In spite of the fact that they have existed for many years, they are, at the moment, of enough importance to be worthy of even political cognizance.

Much remains to be done to improve a system of medical care which is acknowledged to be as good, if not better, than that in any other country of the world. When, as and if we, as physicians, are called on for suggestions as to how these various changes or additions had best be made, let us not open up the possibility of just criticism by denying their need and let us so govern ourselves, now that we have been judged to practice a "learned profession," that we shall never again be accused of engaging in a trade!

SPEAKING OF HOT DOGS

The shouting and the tumult have died away; the captains and the king, and the queen, too, have

departed, leaving behind them on both sides of the International Boundary Line the recollection of a gracious couple doing their bit in the interests of democracy and amity and comity among English-speaking peoples. Which, in the words of the consort of a New York mayor on another occasion when a royal pair was being greeted, is a mouthful.

International amity and comity are perhaps of more general than medical interest, although the profession, too, has its mundane curiosity and scans the headlines with equal avidity and even greater haste than the less intellectual (*sic!*) fractions of the population. When it comes to a matter of the royal diet, however, we reach a topic on which, with mutual interest, physicians may philosophize and kings may cogitate.

The gastronomic high point of their Britannic majesties' tour of good will was undoubtedly reached on that lawn along the Hudson where, while a nation waited, they first ate hot dog. When a dog bites a man, that's to be expected. When a monarch bites a dog, that's news. We wonder if the band struck up "God Save the King." It's something to think of, in these August dog days.

Independence of thought and action in a land of the free and a home of the brave must surely be secure under a leader who has the personal independence not only to elevate a Frankfurter to the Supreme Bench but even to serve one, piping hot and presumably dunked in mustard, to the Emperor of India. Perhaps our motto should be changed to *Cave canem*.

We can find no common meeting ground with those of our fellow countrymen — and there were apparently many of them — who found it possible to take the whole episode seriously. Actually, except for its possibilities in the way of disturbed alimentation, the occasion provided the proper degree of relief from an early June heat wave and a severe attack of hero worship. It proved that, despite silk hats, morning coats and admiral's uniforms, "a man's a man for a' that."

MASSACHUSETTS MEDICAL SOCIETY

SECTION OF OBSTETRICS AND GYNECOLOGY*

RAYMOND S. TITUS, M.D., *Secretary*
330 Dartmouth Street
Boston

ACUTE INVERSION OF THE UTERUS

Mrs. R. H., a twenty-six-year-old primipara at term, entered the hospital in labor on January 11, 1918. After nine hours of labor she was delivered normally of a female child weighing 5 pounds, 11 ounces.

The family history was not obtained. The patient gave a history of measles and mumps in childhood; no operations had been performed.

Physical examination on admission showed a well-developed woman with an enlarged abdomen that corresponded in size and appearance to that of a full-term pregnancy. The lungs were clear and resonant, and the heart sounds were regular at the rate of 84 per minute. There were no murmurs. Pelvimetry showed the measurements to be within normal limits. The fetal heart rate was 134 per minute, and the fetus was in LOA position. The blood pressure was 120 systolic, 80 diastolic.

Following delivery the patient had a slight postpartum hemorrhage due to partial separation of the placenta, which was expressed after several manipulations by the Credé method. At this time the pulse had increased to 160 and the patient appeared to be in a moderate shock. Following a hypodermoclysis of 500 cc. of normal saline solution, the pulse dropped to 140. Four hours later the patient had a small vaginal hemorrhage of approximately 150 cc.

During the next three days her condition gradually improved except for urinary retention and a daily afternoon temperature of about 103°F. An intrauterine douche was advised, and on attempting to insert the douche nozzle, a large mass, the size of a fist, was found presenting at the vulva. It was tender to touch and sloughing. The odor was extremely foul. A finger could be passed around the mass, but no cervical canal could be found although there was a dimple on either side of the mass. The vagina was douched with warm sterile water, and the condition was diagnosed as an acute inversion of the uterus.

*A series of selected case histories by members of the section will be published weekly. Comments and questions by subscribers are solicited and will be discussed by members of the section.

On the fifth postpartum day an attempt to replace the uterus per vaginam under ether anesthesia was unsuccessful. The patient went into shock and was given the usual shock therapy.

The following day another attempt at replacement from below was unsuccessful. The abdomen was then opened and an attempt was made to stretch the cervical ring from above and to push the fundus up from below. This also was unsuccessful. The posterior vaginal wall was then incised, and the uterus pushed up through the incision and excised. Drains from the pelvis were placed in the vagina and through the abdominal wall.

The patient did well for eight days. Then the legs began to swell, the abdomen became distended, and she developed the typical signs and symptoms of peritonitis. She died on the fifteenth postoperative day.

Comment. Undoubtedly the inversion occurred at the time of delivery, and the usual dimpling of the fundus was not appreciated. Had a vaginal examination been made, the condition would have been diagnosed at a time when reposition by vaginal manipulation could have been done successfully. It is probable too that a vaginal operation such as that described in the case reported in the *Journal* on July 6, 1939, would have resulted in successful reposition without the need of entering the abdominal cavity. The uterine sepsis possibly would have taken care of itself once the fundus was replaced and normal circulation re-established. The swelling of the legs was undoubtedly due to a pelvic phlebitis and peritonitis. This case emphasizes the seriousness of inversion when the condition is not recognized and treated immediately.

DEATHS

EMARD — George Adelbert Emard, M.D., of Mansfield, died August 3. He was in his fifty-eighth year.

Born in Quebec, he graduated from Tufts College Medical School in 1918. Dr. Emard had served on the staff of the Sturdy Memorial Hospital, North Attleboro, for ten years.

Dr. Emard was a member of the Massachusetts Medical Society and a fellow of the American Medical Association.

His widow survives him.

IRWIN — Vincent J. Irwin, M.D., formerly of Springfield, died at Tampa, Florida, on June 19. He was in his eighty-third year.

Born in Holyoke, he received his degree from the University of Vermont College of Medicine in 1896. Dr. Irwin was a retired member of the Massachusetts Medical Society, a member of the American Medical Association and the American Academy of Ophthalmology and Oto-Laryngology.

His widow, a son, brother and sister survive him.

LORING — Benjamin T. Loring, M.D., of 186 Mt. Auburn Street, Watertown, died July 29. He was in his seventy-first year.

Dr. Loring received his degree from Boston University School of Medicine in 1898. He held memberships in the Massachusetts Medical Society and the American Medical Association.

MISCELLANY

RÉSUMÉ OF COMMUNICABLE DISEASES IN MASSACHUSETTS FOR APRIL, 1939

DISEASES	APRIL 1939	APRIL 1938	FIVE-YEAR AVERAGE*
Anterior poliomyelitis	1	0	1
Chickenpox	721	1300	1154
Diphtheria	11	16	26
Dog bite	960	959	919
Dysentery, bacillary	7	14	4
German measles	96	104	1934
Gonorrhea	355	399	455
Lobar pneumonia	610	540	561
Measles	4068	1437	4256
Meningococcus meningitis	4	7	16
Mumps	709	1109	1021
Paratyphoid B fever	0	6	8
Scarlet fever	770	1641	1211
Syphilis	423	516	495
Tuberculosis, pulmonary	245	443	325
Tuberculosis, other forms	31	48	36
Typhoid fever	8	2	5
Undulant fever	2	2	3
Whooping cough	802	421	872

*Based on figures for preceding five years.

RARE DISEASES

Anterior poliomyelitis was reported from: Cambridge, 1; total, 1.

Anthrax was reported from: Lynn, 1; total, 1.

Diphtheria was reported from: Boston, 2; Brockton, 1; Canton, 1; Lawrence, 3; Salem, 2; Springfield, 1; Winthrop, 1; total, 11.

Dysentery, bacillary, was reported from: Wellesley, 5; Wrentham, 2; total, 7.

Infectious encephalitis was reported from: East Longmeadow, 1; New Bedford, 1; total, 2.

Malaria was reported from: Boston, 1; Cambridge, 1; Winthrop, 1; total, 3.

Meningococcus meningitis was reported from: Manchester, 1; Melrose, 1; Stoneham, 1; Wilmington, 1; total, 4.

Septic sore throat was reported from: Belmont, 2; Boston, 4; Braintree, 1; Brookline, 1; Cambridge, 2; Fall River, 5; Gardner, 2; Lexington, 1; Malden, 2; Medford, 1; Newton, 2; South Hadley, 1; Stoneham, 2; Topsfield, 1; Walpole, 1; Watertown, 1; Westport, 1; total, 30.

Trachoma was reported from: Boston, 3; total, 3.

Typhoid fever was reported from: Boston, 1; Erving, 1; Marlboro, 1; Orange, 1; Revere, 1; Springfield, 1; Taunton, 1; Waltham, 1; total, 8.

Undulant fever was reported from: Attleboro, 1; Brockton, 1; total, 2.

Diphtheria showed record low incidence except for 1937, which was equaled.

Measles, German measles, scarlet fever, whooping cough, mumps and chickenpox were reported below the five-year average.

Meningococcus meningitis showed record low figures.

Lobar pneumonia and typhoid fever were reported above the five-year average.

Pulmonary tuberculosis was reported at a record low figure.

Tuberculosis (other forms) continued to show low incidence.

The incidence of undulant fever was not remarkable.

Animal rabies showed record low incidence for the fifth consecutive month.

MAINE NEWS

Nominating Committee Report

The Nominating Committee, composed of Drs. F. B. Ames, chairman; J. C. Oram, S. H. Kagan, E. M. McCarty, H. L. Apollonio and R. V. Bliss, made the following nominations at the meeting of the House of Delegates of the Maine Medical Association, June 26, at Poland Springs, Maine, which were duly confirmed:

STANDING COMMITTEES

Scientific Committee

M. F. S. Greene, chairman	Lewiston
H. C. Scribner	Bangor
Mortimer Warren	Portland
C. C. Weymouth	Farmington

Committee on Medical Education and Hospitals

A. P. Leighton, chairman	Portland
T. A. Foster	Portland

Medical Advisory Committee

C. M. Robinson, chairman	Portland
Allan Woodcock	Bangor
G. E. Young	Skowhegan
W. H. Bunker	Calais
C. H. Jameson	Rockland
F. H. Jackson	Houlton
F. B. Ames	Bangor
The secretary, ex-officio	

Legislative Committee

The president, ex-officio, chairman	
The president-elect, ex-officio	
R. V. Bliss	Bluehill
Warren Steele	Lewiston
N. H. Nickerson	Greenville

Public Relations Committee

Warren Kershner, chairman	Bath
F. T. Hill	Waterville
H. C. Knowlton	Bangor
C. W. Kinghorn	Kittery
W. A. Ellingwood	Rockland

Cancer Committee

F. B. Ames, chairman	Bangor
Magnus Ridlon	Bangor
E. H. Risley	Waterville
William Holt	Portland
P. E. Belliveau	Lewiston

Committee on Social Hygiene

E. S. Merrill, chairman	Bangor
B. B. Foster	Portland
C. B. Popplestone	Rockland

Publicity Committee

T. A. Foster, chairman	Portland
The secretary, ex-officio	

SPECIAL COMMITTEES

Committee on Nursing Affairs

B. L. Bryant, chairman	Bangor
S. S. Brown	Portland
G. A. Tibbetts	Portland

Tuberculosis Committee

G. E. Young, chairman	Skowhegan
Lester Adams	Hebron
Walter Gumprecht	Bangor

Committee on Investigation of Collection Agencies

E. W. Gehring	Portland

Advisory Committee on Syphilis Control

B. B. Foster, chairman	Portland
C. E. Blaisdell	Bangor
A. H. Morrell	Augusta

Committee on Prevention and Amelioration of Deafness

Harry Butler, chairman	Bangor
P. J. Mundie	Calais
G. O. Cummings	Portland
W. A. Ellingwood	Rockland
W. H. Chaffers	Lewiston

Committee on Problems of Health Insurance and State Medicine

W. E. Kershner, chairman	Bath
F. T. Hill	Waterville
H. L. Apollonio	Camden

Committee on Graduate Education

F. T. Hill, chairman	Waterville
Julius Gottlieb	Lewiston
F. H. Jackson	Houlton
Eugene Holt	Portland
L. H. Smith	Winterport

Committee on Maternal and Child Welfare

R. B. Moore, chairman	Portland
A. W. Fellows	Bangor
C. S. Bauman	Waterville
G. W. Twaddle	Lewiston

Delegate to American Medical Association

William A. Ellingwood	Rockland

Resolution

At the eighty-seventh annual meeting of the Maine Medical Association held at Poland Springs, Maine, the House of Delegates in session June 26 voted to accept the following resolution as presented by George L. Pratt, of Farmington, and approved by the Council.

> Resolved: That in the opinion of the Maine Medical Association, the Wagner Health Act proposes a revolutionary change in the practice of medicine, which is not justified by reliable evidence; that the cost of the proposed legislation would be tremendous and indefinite; that it is impossible to amend the act so as to make it workable; that our senators and representatives in Washington be informed that the Maine Medical Association urges them to oppose the passage of the act.

New Licensees

The following physicians were licensed to practice medicine and surgery in Maine on March 15, 1939:

THROUGH EXAMINATION

Helen Bane	Farmington
Sidney Robert Branson	Passaic, New Jersey
Ernest La Pierre Coffin	Bar Harbor
Frederick Collins Dennison	Lynn, Massachusetts
George Pierre Desjardins	Brunswick
Walter Louis Henry Hall	Orono
Lillian Gertrude Moulton	Northboro, Massachusetts
Alfred Oestrich	Rumford
Julius Sherman	Mattapan, Massachusetts
Frank Rocco Visceglia	Brooklyn, New York

THROUGH RECIPROCITY

Henry Almond	Rochester, New Hampshire
Nicholas Famularo	Queens Village, New York
Chester Winfield Malmstead	Bangor

NATIONAL SCHOLARSHIPS AT HARVARD

Selection of the three outstanding candidates for admission to the Harvard Medical School next fall as recipients of scholarships offered by the school under Harvard University's long-term scholarship policy was recently announced. The winners are Louis E. Ward, of Mt. Vernon, Illinois, Illinois S.B. '39; Samuel R. Ginsburg, of Passaic, New Jersey, Princeton A.B. '39; and Allan L. Friedlich, Jr., of New York City, Dartmouth A.B. '39.

This is the third year of the medical school's National Scholarship plan, which is similar to that introduced by President James B. Conant in Harvard College in 1934, and subsequently adopted also by the Graduate School of Arts and Sciences and the Graduate School of Design.

The medical school also announced that the three students who held the awards in the entering class last year have maintained high honor records, and under the terms of the grants have had their stipends renewed for the remaining three years of their medical studies. They are Glen T. Leymaster, of Aurora, Nebraska; Clarke T. Case, of Pyinmana, Burma, India; and Laurence G. Wesson, Jr., of Baltimore. The three holders of National Scholarships who are entering their third year of study at the school are Ward S. Fowler, of Eldora, Iowa; Carl C. Gardner, Jr., of Columbia, Tennessee; and William F. Loomis, of Tuxedo Park, New York.

GENITOINFECTIOUS-DISEASE CONTROL

"The sum of $4,379,250 will be allotted to the states for venereal-disease control programs during the coming twelve months," Surgeon General Thomas Parran, United States Public Health Service, recently announced.

This expenditure is made possible by the LaFollette–Bulwinkle Act of 1938, which authorized an appropriation of $5,000,000 for the fiscal year 1940. Allotments to the states constitute 86.9 per cent of the total amount available for venereal-disease control work. The remaining 13.1 per cent, amounting to $620,750, will be used for research, laboratory and field demonstrations, and administration.

The federal allotment, which will be supplemented by state and local appropriations and by special grants from foundations and other private organizations, will represent a larger sum of money than has been available for venereal-disease control programs in any previous year. Dr. Parran pointed out, however, that "funds now available do not yet approximate the estimates considered by medical and public-health authorities to be necessary for the most effective public-health campaign against syphilis and gonorrhea." It is expected that additional allotments from public and private sources will be sought for 1941.

The federal government's share for venereal-disease control work in the states and localities during the next twelve months' period has been allotted on the basis of population, the extent of the venereal-disease problem, and the financial needs of the various sections of the country.

In order to receive these grants, the Surgeon General announced that states must meet certain general minimum requirements in the prevention, treatment and control of venereal diseases. These requirements are based on recommendations adopted by the Conference of State and Territorial Health Officers on April 13, 1936. Federal funds for venereal-disease control programs must be matched by state or local funds and must not replace funds from such sources already being used.

CORRESPONDENCE

ARTICLES ACCEPTED BY THE AMERICAN MEDICAL ASSOCIATION COUNCIL ON PHARMACY AND CHEMISTRY

To the Editor: In addition to the articles enumerated in our letter of June 2 the following have been accepted:

Abbott Laboratories

Sulfanilamide — Abbott, 4 gm. ampules (crystals)

The Denver Oxygen Co.

Carbon Dioxide-Oxygen Mixture
- Carbon Dioxide-Oxygen Mixture: Carbon Dioxide 5 per cent, Oxygen 95 per cent
- Carbon Dioxide-Oxygen Mixture: Carbon Dioxide 7 per cent, Oxygen 93 per cent
- Carbon Dioxide-Oxygen Mixture: Carbon Dioxide 10 per cent, Oxygen 90 per cent

Lederle Laboratories, Inc.

Immune Globulin (Human) — Lederle
Tablets Ascorbic Acid — Lederle, 0.025 gm.

Wm. S. Merrell Co.

Ampules Caffeine with Sodium Benzoate, 2 cc.
Sulfanilamide — Merrell
- Sulfanilamide Tablets, 5 gr.
- Sulfanilamide Tablets, 7½ gr.

Winthrop Chemical Co., Inc.

Salyrgan-Theophylline Solution (Winthrop)
- Ampule Solution Salyrgan-Theophylline, 1 cc.
- Ampule Solution Salyrgan-Theophylline, 2 cc.

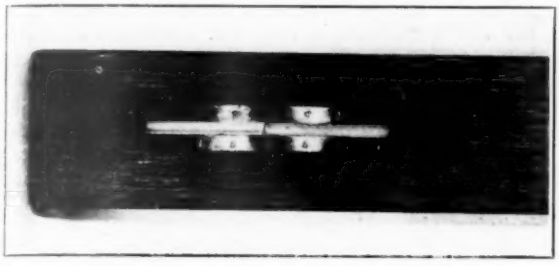
Paul Nicholas Leech, *Secretary.*

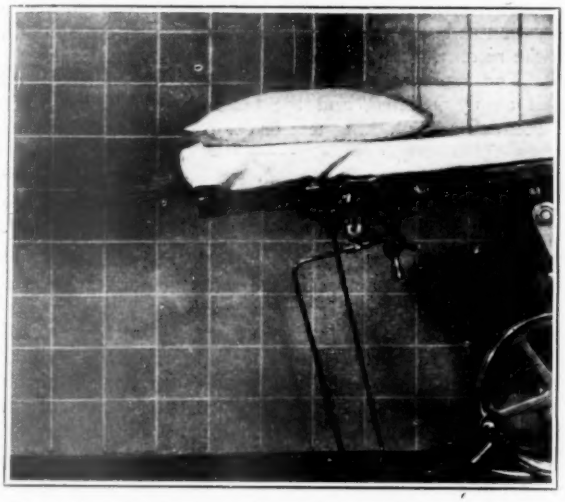
535 North Dearborn Street,
Chicago, Illinois.

TILT RECORDER

To the Editor: When the Springfield Hospital started to use glucose and pontocaine for subarachnoid anesthesia, it seemed fitting that we should have a simple and inexpensive instrument for measuring the tilt of the table. Our carpenter constructed for us a spirit level, the picture of which is enclosed. This instrument has the advantages

of full vision, rapid transportation and unlikelihood of becoming mislaid, and it does not interfere with the draping of the patient or the manipulation of the table.





The end of this level can be tucked under the mattress or pillow of any table and under any circumstances, and always gives a true reading.

W. A. R. Chapin, M.D.

121 Chestnut Street,
Springfield, Massachusetts

NOTICES

REMOVAL

Arnold Starr, M.D., announces the removal of his office to 520 Beacon Street, Boston.

SOCIETY MEETINGS AND CONFERENCES

Calendar of Boston District for the Week Beginning Monday, August 14

Tuesday, August 15

*10 a. m.–12:30 p. m. Boston Dispensary tumor clinic.

Friday, August 18

*10 a. m.–12:30 p. m. Boston Dispensary tumor clinic.

Saturday, August 19

*10 a. m.–12 m. Staff rounds of the Peter Bent Brigham Hospital. Conducted by Dr. Robert T. Monroe.

*Open to the medical profession.

August 30–September 2 — Seminar in Physical Therapy. Page 857, issue of May 18.

September — Boston Psychoanalytic Institute. Page 450, issue of September 22, 1938.

September 4–6 — Institute for the Consideration of the Blood and Blood-Forming Organs. Page 941, issue of June 1.

September 4–6 — Institute at University of Wisconsin Medical School. Page 160, issue of July 27.

September 5–8 — American Congress of Physical Therapy. Hotel Pennsylvania, New York City. Page 857, issue of May 18.

September 11–15 — American Congress on Obstetrics and Gynecology. Page 938, issue of December 8.

September 14–16 — Biological Photographic Association. Page 941, issue of June 1.

September 15–28 — Pan-Pacific Surgical Association. Page 863, issue of November 24.

October 23–November 3 — New York Academy of Medicine. Page 977, issue of June 8.

Fall, 1939 — Temperature Symposium. Page 218, issue of February 2.

December 2 — American Board of Obstetrics and Gynecology. Page 1019, issue of June 15.

January 6, June 8–11, 1940 — American Board of Obstetrics and Gynecology. Page 160, issue of July 27.

March 7–9, 1940 — The New England Hospital Association. Hotel Statler, Boston.

May 14, 1940 — Pharmacopoeial Convention. Page 894, issue of May 25.

June 7–9, 1940 — American Board of Obstetrics and Gynecology. Page 1019, issue of June 15.

BOOK REVIEWS

L'Année Thérapeutique: Médications et procédés nouveaux. A. Ravina. 188 pp. Paris: Masson et Cie, 1939. 25 Fr. fr.

Never in the history of medicine have so many important and far-reaching therapeutic advances been made as in recent years. It is very difficult for anybody practicing medicine today to keep pace with all these advances. A good brief review of important contributions to therapy, therefore, fills an important need. However, any writer who attempts each year to sift out from among the enormous number of papers dealing with therapy those which present lasting useful contributions is confronted with an extremely difficult task. Furthermore, when a single writer deals with a great variety of subjects, his judgment is likely to appear somewhat distorted in certain fields with which he is not intimately acquainted. This is particularly true of many Continental writers who frequently obtain at least their first acquaintance with much of their foreign literature from abstracts which are themselves frequently inaccurate. One objection often raised in this country to foreign works, particularly the French contributors, is that they lack that insistence on "rational therapy," which is characteristic of the teaching of materia medica in this country and which is so well reflected in the American medical literature.

This small volume contains résumés of papers covering most of the important therapeutic contributions of the past year. The author has chosen to abstract only papers which present practical clinical experience. In so doing, however, he has included a number with recommendations that appear to us a little fantastic; for example, the treatment of hypertension with a diet consisting solely of raw pears, and the treatment of leprosy with vitamin B_1.

The volume is divided into three parts; the first section contains isolated contributions to the therapy of individual diseases or conditions which are arranged alphabetically. In this section are included, among others, references to favorable results of treatment of psychasthenias with male sex hormones, of acute alcoholic delirium with insulin, of Parkinson's syndrome with Bulgarian belladonna, of painful herpes with snake venom, of lichen planus with stovarsol, and of Menière's syndrome with pilocarpine. There are also included favorable results with therapeutic methods which have not received or are not likely to receive enthusiastic reception in this country: autohemotherapy of rheumatism; shock therapy of gonorrheal conjunctivitis; folliculin treatment of enu-

resis; lupus erythematosus with quinine bisulfate; general paresis with thyroxine; traumatic arthritis with lactic acid, and so forth.

The second section includes methods or therapeutic technics and contains papers on various anesthetics, general and local, the ionization treatment of neuralgias, and oxygen therapy. The dangers and limitations of mammography are noted.

The final section deals with new medications. The part dealing with heparin includes reports on its use locally or intravenously to prevent postoperative thromboses and also its use as an anticoagulant in transfusions, either by adding it to the shed blood or by its intravenous injection into the donor before he is bled. A number of reports on the use of sulfanilamide, sulfapyridine and related compounds in certain bacterial and other infectious diseases are mentioned. Many reports on vitamin therapy are included, mostly favorable reports, but some of the most important contributions from this country are omitted.

There are bound to be numerous important omissions in such a volume, and perhaps the most important gaps are from the American literature. Furthermore, although there is a small amount of editorial comment, this is limited mostly to introducing the various items but, as is almost inevitable in a work of this sort, there is no critical evaluation.

The subjects dealt with are presented clearly and in a manner which the practitioner of medicine will greatly appreciate. It is very readable even to those with only a superficial knowledge of French. There is an index of the subjects covered in the previous reviews from 1931 to 1937.

The New International Clinics. Original contributions; clinics; and evaluated reviews of current advances in the medical arts. Edited by George M. Piersol. Vol. 1, N. S. 2. 312 pp. Philadelphia, Montreal and New York: J. B. Lippincott Co., 1939. $3.00.

As usual in these volumes, the subjects covered are various: chronic brucellosis (Malta fever), the treatment of diabetes mellitus, an explanation of electrocardiography and a review of edema and dehydration. The character of the articles is good, many of them being short reviews, well-written and authentic.

St. Thomas's Hospital Reports. Edited by O. L. V. S. De Wesselow and C. Max Page, assisted by N. R. Barrett, J. St. C. Elkington and A. J. Wrigley. Vol. 3, Ser. 2. 240 pp. London: St. Thomas's Hospital, 1938.

The volume contains a variety of papers, all of high standard. The papers do not appear to have been published elsewhere, so the volume is not just a group of collected reprints.

A few papers may be mentioned. A case of x-ray carcinoma of thirty-one years' duration is given in detail. Skin changes in the hands were noted within a year; carcinoma developed in fourteen years; metastases in twenty-nine years. The microscopic changes are shown. Another paper is an excellent review of the subject of gastritis. Putrid lung abscess is considered in another review. The volume closes with a bibliography of recent publications by St. Thomas's men and abstracts of papers not contained in the present work.

Glaister's Medical Jurisprudence and Toxicology. Edited by John Glaister. Sixth edition. 747 pp. Baltimore: William Wood & Co., 1938. $8.00.

This work, now in its sixth edition, by a man who is not only a graduate in medicine, but also a barrister-at-law, has become the standard text on the subject in England.

The subject is presented in two sections, medical jurisprudence and toxicology.

The method of approach to medicolegal problems tends to be more legalistic than is true of American texts, but the work is comprehensive, and is made interesting by the inclusion of actual cases illustrating methods of meeting problems. Much greater attention is paid to the questions which may arise in connection with lunacy and infanticide than is usual here. Among others the chapter on identification of bodies is exhaustive, with detailed description of the reconstitution of the bodies in the Ruxton case.

The approval of this volume throughout Great Britain is amply justified, and the book can be highly recommended as a working text or for reference.

Bacteria: The smallest of living organisms. Ferdinand Cohn (1872). Translated by Charles S. Dolley (1881). 44 pp. Baltimore: The Johns Hopkins Press, 1939. $1.00.

This book is another in the series of publications from the *Bulletin of the History of Medicine*. Its purpose, as was that of the previous volumes, is to introduce readers to early original investigations. Morris C. Leikind, a careful student of the history of bacteriology, rightfully says in his introduction: "We have here a brilliant summary of the position of bacteriological studies as they were considered just before Koch opened what has been called by some the Golden Age of Bacteriology." Here is a further opportunity for teachers to add to their list of books for collateral reading.

General Semantics. Alfred Korzybski et al. 111 pp. New York: Arrow Editions, 1938. $2.00.

This paper-covered pamphlet consists of a series of articles, and excerpts of articles, which were read at the First American Congress for General Semantics, held at Ellensburg, Washington, in March, 1935. In keeping with Korzybski's statement that "general semantics is not a medical science, but an auxiliary experimental natural science, and a link between medical science, education, exact science and daily life," the papers deal with a wide range of topics. Logic, linguistics, education, sociology, biology and psychiatry are discussed from a general semantics point of view. The majority of the papers are reports of the authors' attempts to apply the theories which Korzybski has put forth in his book, *Science and Sanity*.

Sleep: Your life's one third. Maurice Chideckel. 183 pp. New York: The Saravan House, 1939. $2.00.

This is one of the worst books that has come to the reviewer's attention in years. Errors in spelling, misstatements, loose writing and bad thinking appear on every page. Quick oblivion would be a kindly fate for a book of this character. Unfortunately, it is endorsed by a foreword, written by a visiting psychiatrist of the Johns Hopkins Hospital, who thinks the author's notes are clear and scientific. The reviewer found the book, however, not only muddy and unscientific, but so badly constructed as to be useless, at times ludicrous and thoroughly unsound.